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# O-ring

## I. Overview

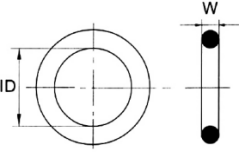
### Features

O-rings are widely used in various dynamic and static sealing applications due to their low manufacturing cost and ease of use.

### Standards

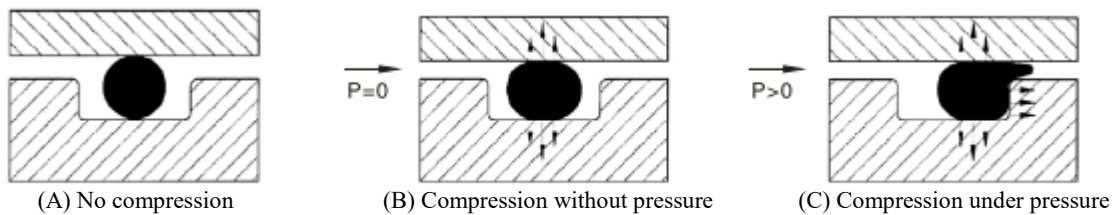
Most countries have developed a series of standards for O-rings, among which the American standard (AS 568), Japanese standard (JIS B 2401), and international standard (ISO 3601/1) are more commonly used.

#### ■ List of O-ring standards

Standard	O-ring Cross-sectional Diameter (W)	
AS 568 BS 1516	1.78 2.62 3.53 5.33 6.99	
JISB2401	1.90 2.40 3.10 3.50 5.70 8.40	
ISO 3601/1 DIN 3771/1 GB 3452.1	1.80 2.65 3.55 5.30 7.00	
Preferred metric size	1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 7.0 8.0 10.0 12.0	
AS 568 (900 series)	1.02 1.42 1.63 1.83 1.98 2.08 2.21 2.46 2.95 3.00	

### Sealing principle

The O-ring is an automatic bi-directional sealing element. The pre-compression in radial and axial directions during mounting contributes to the initial sealing capacity of the O-ring itself, which increases as the system pressure increases.



#### ■ Performance parameters

	Static Seal	Dynamic Seal
Working pressure	Up to 20 MPa without a back-up ring; Up to 40 MPa with a back-up ring; Up to 200 MPa with a special back-up ring.	Up to 5 MPa without a back-up ring; Higher pressure with a back-up ring.
Movement speed	The maximum reciprocating speed can reach 0.5 m/s and the maximum rotating speed can reach 2.0 m/s.	
Temperature	General applications: -30°C~+110°C; special rubber: -60°C~+250°C; rotating applications: -30°C~+80°C	
Medium	See <i>Raw Material Characteristics of Rubber Seals</i>	

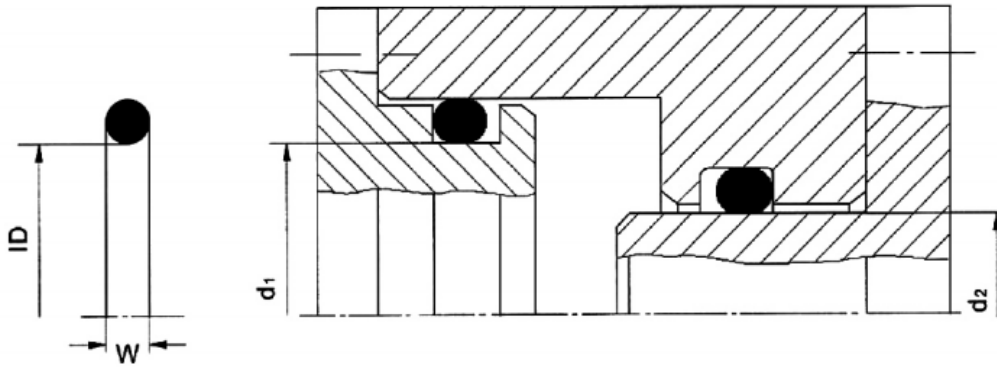
## II. Factors to be Considered for O-ring Selection

### 1. Working medium and working conditions

When selecting the materials for O-rings, their compatibility with the working medium shall be first taken into consideration. Besides, the pressure at the seal, temperature, continuous working time, operating cycle and other working conditions shall also be considered. In rotating applications, the temperature rise caused by frictional heat must be considered. Different sealing materials have different physical and chemical properties. See *Chemical Property Table of Rubber Materials*.

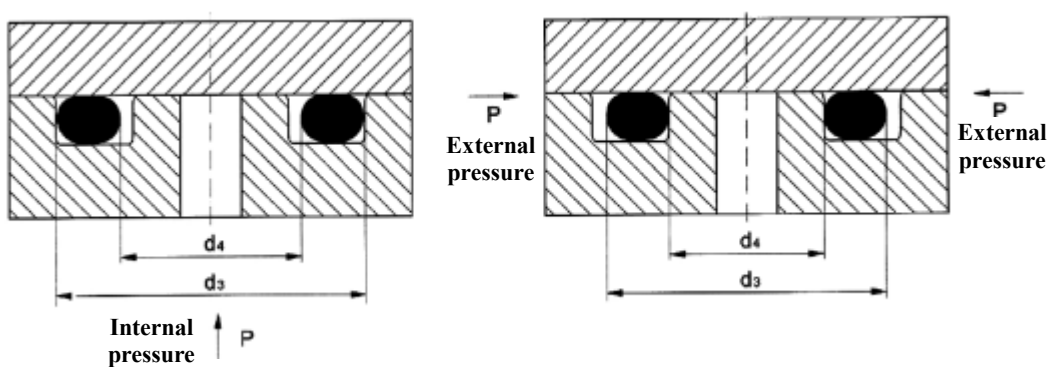
### 2. Seal types

The seal types can be divided into static seal and dynamic seal by load type; or piston seal, shaft seal and rotary shaft seal by sealing purpose; and the mounting types can be divided into radial mounting and axial mounting. For radial mounting of shaft seal, the deviation between the inside diameter of the O-ring and the sealed diameter  $d_2$  should be as small as possible; while of piston seal, the inside diameter should be equal to or slightly smaller than the diameter  $d_1$  of the groove.



**Radial mounting, static seal and dynamic seal**

For axial mounting, the pressure direction shall be considered. For internal pressure, the outside diameter of the O-ring should be about 1-2% larger than that of the groove ( $d_3$ ); for external pressure, the inside diameter of the O-ring should be about 1-3% smaller than that of the groove ( $d_4$ ).



**Axial mounting, static seal**

## III. Other Factors Affecting the Sealing Performance

### 1. O-ring hardness

The hardness of O-ring material is one of the important indexes to evaluate the sealing performance. It determines the compression of the O-ring and the maximum allowable extrusion gap of the groove. If there is no special requirements for the sealing material, 70 Shore A nitrile rubber is generally used as it can meet most of the use conditions. The hardness requirements shall be specified if sealing material of other hardness is required.

### 2. Extrusion gap

The maximum allowable extrusion gap  $g_{max}$  is related to the system pressure, O-ring cross-sectional diameter and material hardness. Generally, the higher the working pressure, the smaller the maximum allowable extrusion gap  $g_{max}$ . If the gap  $g$  exceeds the allowable range, the O-ring will be extruded or even damaged.

### 3. Compression set

Another index to evaluate the sealing performance of O-rings is the compression set of the selected material. Under the action of pressure, the O-ring, as an elastic element, produces elastic deformation, or even permanent plastic deformation as the pressure increases. Compression set  $d$  can be determined by the following formula:

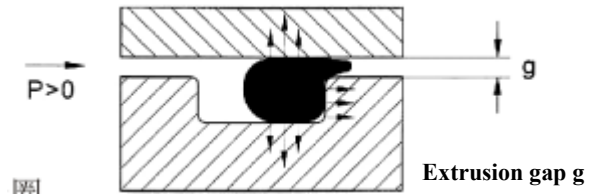
$$d = \frac{b_0 - b_2}{b_0 - b_1} \times 100\%$$

Where:  $b_0$  - original thickness (i.e., cross-sectional diameter  $W$ );  $b_1$  - thickness under compression;  $b_2$  - thickness after compression release. Usually, to prevent permanent plastic deformation, the maximum allowable compression of the O-ring is about 30% of compression set for static seal and 20% for dynamic seal.

#### ■ Maximum allowable extrusion gap $g_{max}$

Pressure Mpa	O-ring Cross-sectional Diameter (W)				
	1.78	2.62	3.53	5.33	7.00
70 Shore A					
≤3.50	0.08	0.09	0.10	0.13	0.15
≤7.00	0.05	0.07	0.08	0.09	0.10
≤10.50	0.03	0.04	0.05	0.07	0.08
80 Shore A					
≤3.50	0.10	0.13	0.15	0.18	0.20
≤7.00	0.08	0.09	0.10	0.13	0.15
≤10.50	0.05	0.07	0.08	0.09	0.10
≤14.00	0.03	0.04	0.05	0.07	0.08
≤17.50	0.02	0.02	0.03	0.03	0.04
90 Shore A					
≤3.50	0.13	0.15	0.20	0.23	0.25
≤7.00	0.10	0.13	0.15	0.18	0.20
≤10.50	0.07	0.09	0.10	0.13	0.15
≤14.00	0.05	0.07	0.08	0.09	0.10
≤17.50	0.04	0.05	0.07	0.08	0.09
≤21.00	0.03	0.04	0.05	0.07	0.08
≤35.00	0.02	0.03	0.03	0.04	0.04

# O-ring



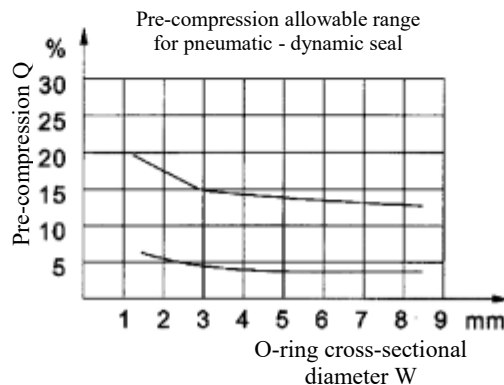
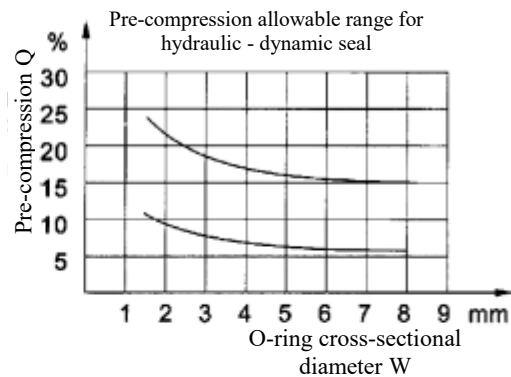
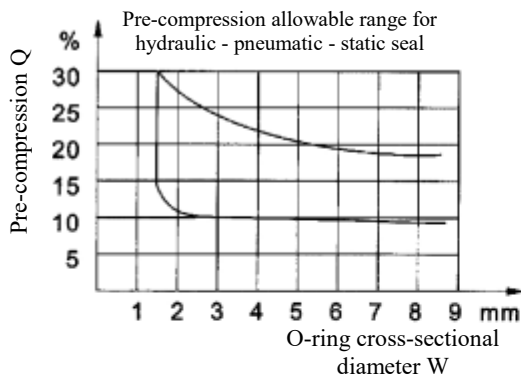
※ A back-up ring is recommended when the pressure exceeds 5 MPa.

※ The recommended fitting is H7/g6 for static sealing applications.

## 4. Pre-compression

The O-ring is installed in groove and an initial compression should be reserved to ensure its sealing performance. For different applications, the pre-compression relative to the cross-sectional diameter  $W$  also varies.

Generally, it is about 15%-30% for static seal and 9%-25% for dynamic seal. The specific pre-compression value can be selected according to the following charts.



## 5. Tension and compression

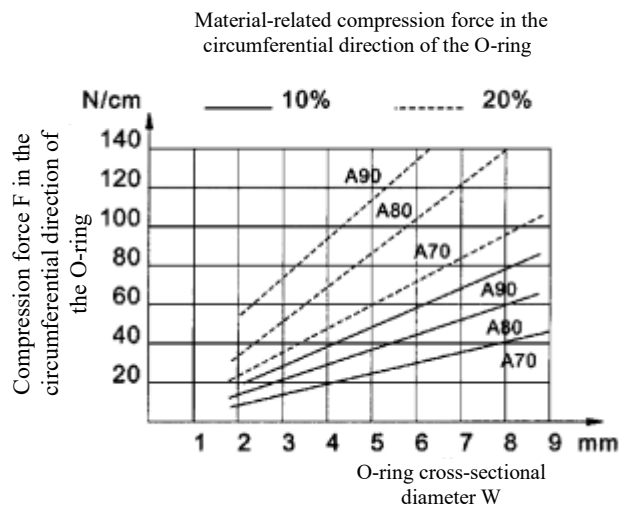
When an O-ring is installed in the groove, it is subjected to tension or compression. If the value of tension and compression is too large, it will lead to excessive increase or decrease of O-ring cross section, because tensioning of 1% correspondingly reduces the cross-sectional diameter  $W$  by about 0.5%. For piston seal, the O-ring should be tensioned, with the maximum allowable tension of 6%; for shaft seal, the O-ring should be compressed in the direction of its circumference, with the maximum allowable circumferential compression of 3%.

## 6. O-rings used for rotary shaft seal

O-rings can also be used for rotary shaft seal with low rotating speed and short running cycle. When the circumferential speed is lower than 0.5 m/s, O-ring selection can be based on the normal design criteria; when the circumferential speed is greater than 0.5 m/s, it must be considered that the elongated rubber ring will shrink when heated. Therefore, the inside diameter of the O-ring shall be about 2% larger than the diameter of the shaft to be sealed, thus avoiding the above phenomenon. After the O-ring is installed in the groove, it is subjected to radial compression, and forms a trace of corrugation in the groove, thus improving the lubrication conditions.

## 7. Mounting compression force

During mounting, the compression force is related to the degree of initial compression and material hardness. The chart shows the relationship between the unit compression force per centimeter of seal circumference and the cross-sectional diameter to estimate the total force required to mount the O-ring.



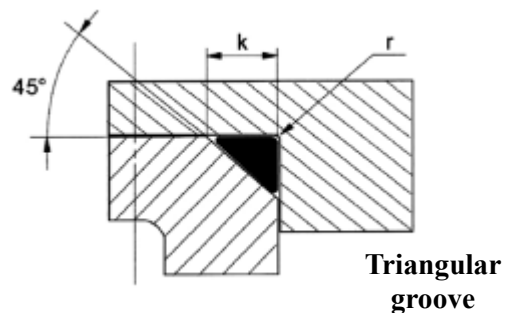
## IV. Mounting Design of O-rings

When the O-ring is installed in the groove, a certain expansion space should be allowed. Usually, the allowed expansion rate is about 15% for static seal and 8% for dynamic seal. Different types of grooves have difference applications. There are four common types of grooves:

### 1. Design for different applications

#### a. Triangular groove

It is commonly used for sealing on flanges and end caps. The disadvantage is that it is more difficult to manufacture and the space for O-ring expansion is very small.



# O-ring

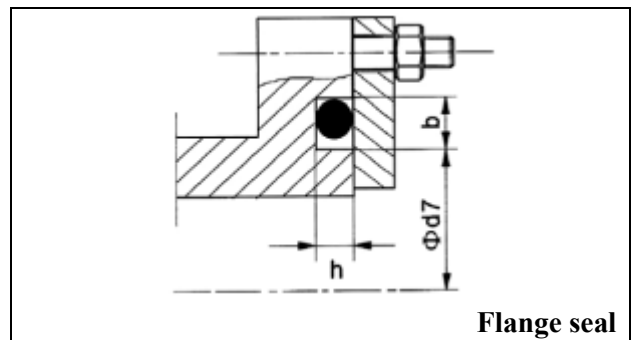
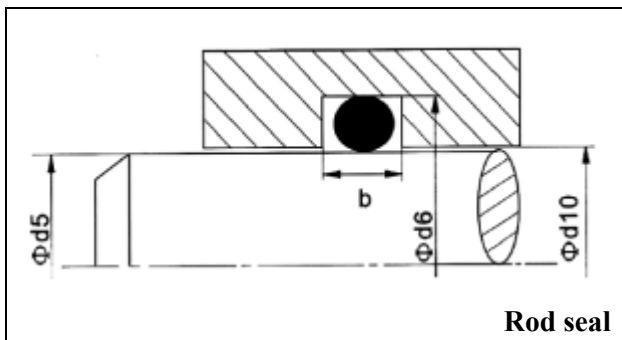
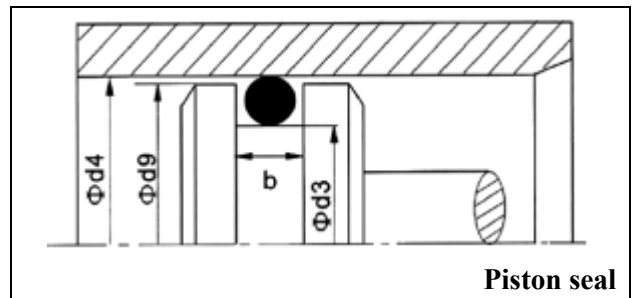
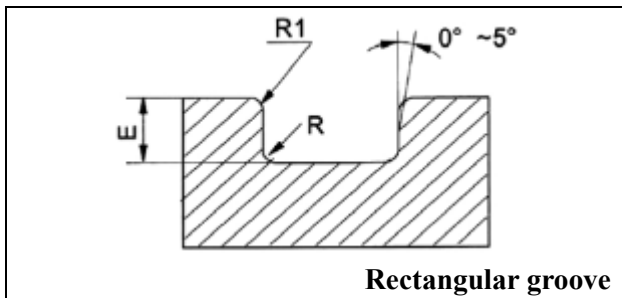
## ■ Triangular groove mounting (unit: mm)

O-ring Cross-sectional Diameter $W$	Edge Length $K$	Radius $r$
1.78 1.80	2.4 +0.10	0.3
2.00	2.7 +0.10	0.4
2.40	3.2 +0.15	0.4
2.50	3.4 +0.15	0.6
2.60 2.62 2.65	3.5 +0.15	0.6
3.00	4.0 +0.25	0.6
3.10	4.1 +0.25	0.6
3.53 3.55	4.7 +0.20	0.9
4.00	5.4 +0.20	1.2
5.00	6.7 +0.25	1.5
5.30 5.33	7.1 +0.25	1.5
5.70	7.6 +0.30	1.5
6.00	8.0 +0.30	1.5
7.00	9.4 +0.30	2.0
8.00	10.8 +0.30	2.0
8.40	11.3 +0.30	2.0

### b. Rectangular groove

It is widely used in various applications. When a back-up ring is not required, it can be made with inclined sides ( $<5^\circ$ ).

※ See pages 17-18 for rectangular groove dimensions. (Recommended Groove Design for O-rings)

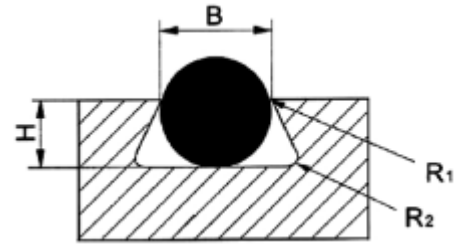




## O-ring

### c. Trapezoidal groove

It is recommended only for special applications where the O-Ring cross-sectional diameter is greater than 2.5 mm. For example, to maintain the top mounting of O-rings, trapezoidal groove form can be considered.



### Trapezoidal groove mounting (Unit: mm)

O-ring Cross-sectional Diameter $W$	Groove Dimensions			
	Width	Depth	Radius	
	$B \pm 0.05$	$H \pm 0.05$	R1	B2
2.5	2.05	2.00	0.25	0.40
2.62 2.65	2.15	2.10	0.25	0.40
3.00 3.10	2.40	2.40	0.25	0.40
3.53 3.55	2.90	2.90	0.25	0.80
4.00	3.10	3.20	0.25	0.80
5.00	3.90	4.20	0.25	0.80
5.30 5.33	4.10	4.60	0.40	0.80
5.70	4.40	4.80	0.40	0.80
6.00	4.60	5.10	0.40	0.80
7.00	5.60	6.00	0.40	1.60
8.00	6.00	6.90	0.40	1.60
8.40	6.30	7.30	0.40	1.60

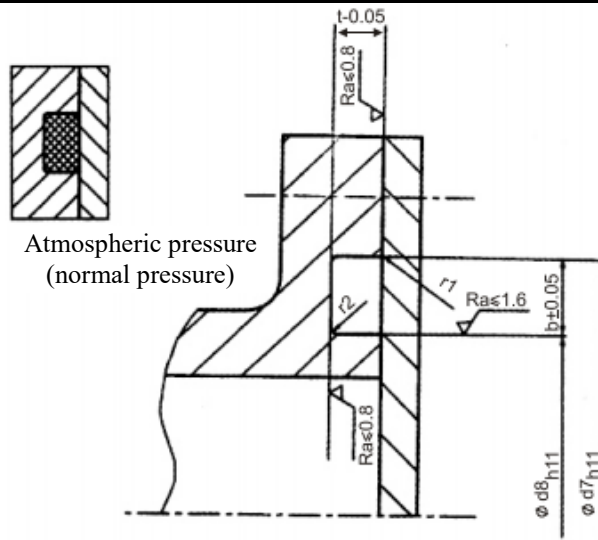
### d Vacuum seal (static seal)

A vacuum seal is a special O-ring seal where the sealed system pressure is less than 1 standard atmosphere ( $P_{atm} = 101.325 \text{ kPG}$ ).

Vacuum seals are usually different from hydraulic static seals, and the requirements of their applications and mounting groove dimensions are as follows:

- The mounting groove space is almost 100% filled by the deformed O-ring, which increases the contact area and extends the diffusion time through the elasticity.
- The O-ring cross-sectional compression deformation is about 30%.
- Vacuum grease should be used (to reduce leakage).
- The surface roughness of each surface of the mounting groove should be higher than that required by hydraulic static seal, and the percentage of the contact range tP should be greater than 50%.
- The O-ring should be made of gas-compatible materials with low permeability and low compression deformation. Fluororubber is recommended.

# O-ring



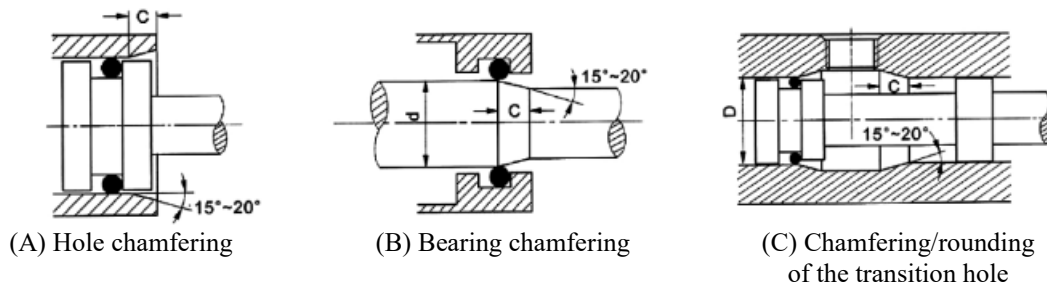
## Vacuum seal mounting

Atmospheric pressure (normal pressure)					Vacuum					Unit: mm
$d_2$	$t^{+0.05}$	$b^{+0.05}$	$r_2$	$r_1$	$d_2$	$t^{+0.05}$	$b^{+0.05}$	$r_2$	$r_1$	
1.5	1.05	1.8	0.1	0.2	5.3	3.7	6.3	0.2	1	
1.78	1.25	2.1	0.1	0.2	5.33	3.7	6.3	0.2	1	
1.8	1.25	2.1	0.1	0.2	5.5	3.8	6.6	0.2	1	
2	1.4	2.3	0.1	0.3	5.7	4	6.7	0.2	1	
2.5	1.75	2.9	0.1	0.3	6	4.2	7.1	0.2	1	
2.6	1.8	3	0.1	0.4	6.5	4.6	7.6	0.2	1	
2.62	1.85	3.1	0.1	0.4	6.99	4.9	8.2	0.3	1	
2.65	1.85	3.1	0.1	0.4	7	4.9	8.2	0.3	1	
2.7	1.9	3.15	0.1	0.4	7.5	5.3	8.7	0.3	1	
2.8	1.95	3.2	0.1	0.4	8	5.6	9.4	0.3	1	
3	2.1	3.5	0.1	0.6	8.4	5.9	9.9	0.3	1	
3.1	2.2	3.6	0.1	0.6	8.5	6	10	0.3	1	
3.5	2.45	4.1	0.2	0.6	9	6.4	10.5	0.3	1	
3.53	2.5	4.1	0.2	0.6	9.5	6.7	11.2	0.3	1	
3.55	2.5	4.15	0.2	0.6	10	7.1	11.7	0.3	1	
3.6	2.5	4.2	0.2	0.6						
3.7	2.6	4.3	0.2	0.6						
4	2.8	4.7	0.2	0.6						
4.5	3.15	5.3	0.2	0.8						
5	3.5	5.9	0.2	0.8						

Note:  $d_2$  is O-ring cross-sectional diameter.

## 2. Local structure design

Because the O-ring is subjected to extrusion during mounting, the hole end or shaft end must be chamfered to 15° to 20° to avoid damage, and the edges should be rounded and deburred. If the O-ring is installed through the transverse hole, the transition hole must also be chamfered or rounded.



## O-ring

### ■ Minimum length of chamfering $C_{min}$ unit: mm

Cross-sectional Diameter W		$\leq 1.78, 1.80$	$\leq 2.62, 2.65$	$\leq 3.53, 3.55$	$\leq 5.30, 5.33$	$\leq 7.00$	$> 8.40$
Minimum length of chamfering $C_{min}$	15°	2.5	3.0	3.5	4.0	5.0	6.0
	20°	2.0	2.5	3.0	3.5	4.0	4.5

Chamfered surface roughness:  $RZ \leq 4. \mu m$        $Ra \leq 0.8 \mu m$

### 3. Groove machining precision and surface requirements

Normally, small grooves, scratches, pits, concentric or spiral machining marks are not allowed on the sealed surface and groove surface. For movable fit, the surface requirements are higher than that of stationary fit.

#### Surface roughness of the groove part

\* Use  $R_y$  for static seal

Machine Part	Purpose	Pressure Action		Surface Roughness	
				$R_a$	$R_y$ (reference)
Groove side and bottom	Static seal	Without pulse	Flat surface	3.2	12.5
			Cylindrical surface	1.6	6.3
		With pulse		1.6	6.3
	Dynamic seal	With a back-up ring		1.6	6.3
Without a back-up ring		0.8	3.2		
Contact surface of O-ring sealing part	Static seal	Without pulse		1.6	6.3
		With pulse		0.8	3.2
	Dynamic seal --		0.4	1.6	
Chamfered part for O-ring mounting	—	—		3.2	12.5

## V. O-ring Mounting

When mounting O-rings, pay attention to the following matters:

- Make sure the edges or transition holes are chamfered or dulled and deburred.
- Check the sealed surface for defects.
- Remove all machining residues.
- Protect the threads in the mounting path with a protective sleeve to prevent the sharp corners of the threads from scratching the O-ring.
- To facilitate mounting, grease the O-ring mounting surface.
- When mounting manually, do not use sharp tools, but try to use tools effectively to ensure that the O-ring is not twisted.
- Excessive tension of the O-ring is prohibited.
- O-rings made of sealant strips are not allowed to be stretched at their joints.
- If automatic mounting is carried out, adequate preparation must be made. For example, to facilitate mounting, the surface of the O-ring can be coated with molybdenum, graphite, talcum powder or PTFE.

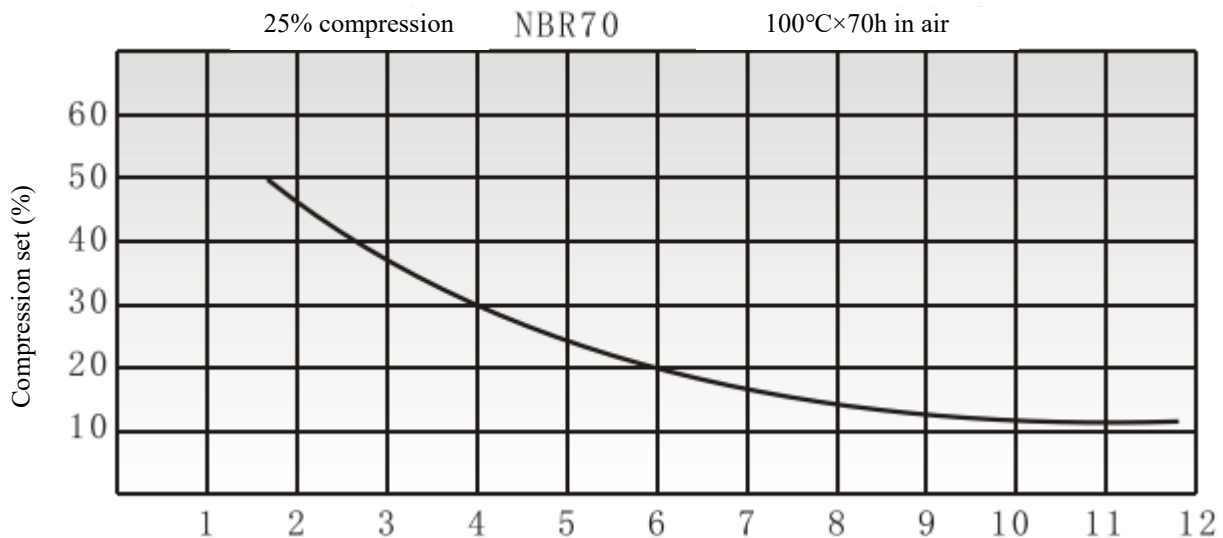
## VI. Storage

Seals are often stored as spare parts for a longer period of time. In order to avoid the external factors from affecting the physical and chemical properties of the O-ring, thus damaging the elastomer, the following rules should be observed during storage:

- Store in a dry place.
- The storage temperature ranges from +5°C to +25°C, and avoid direct contact with heat source.
- Avoid direct exposure to sunlight or neon light.
- Keep in original boxes or airtight containers to prevent oxidation.
- Keep away from harmful gas sources (e.g. ozone) to prevent damage to the elastomer.
- Do not tie and hang O-rings on nails or metal wires with thin cords, which may deform and damage the O-ring.
- Discoloration and white powder (frosting) may occur during storage, but it does not affect the function of the O-ring.

### Selection of cross-sectional diameter

The following chart shows the relationship between the O-ring cross-sectional diameter (line diameter) and the compression set. At a certain compression rate, the compression set is small if the diameter is large, and a stable seal can be obtained by using a large-diameter O-ring. In particular, when used as a dynamic seal, the O-ring of a large diameter has the effect of preventing twisting.



### Hardness

Hardness can be expressed in terms of Shore A or IRHD. The standard hardness is 70 Shore A or 73 IRHD.

Shore hardness	60	70	80	90
IRHD hardness	63	73	83	92
The allowable deviation is $\pm 5$ ; See DIN53505 and DIN53519 for hardness test method.				

# O-ring

The allowable dimension deviation of NBR O-ring of 70 Shore A is shown in the table below:

ID± Tolerance				W± Tolerance	
-3	0.14	120-150	1.2	-1.8	0.08
3-6	0.15	150-180	1.4	1.8-2.6	0.09
6-10	0.17	180-250	1.8	2.6-3.5	0.10
10-18	0.20	250-300	2.1	3.5-5.3	0.13
18-30	0.30	300-350	2.5	5.3-7	0.15
30-50	0.40	350-400	2.8	7-8	0.17
50-80	0.65	400-500	3.4	8-10	0.20
80-100	0.85	500-650	4.3	10-15	0.25
100-120	1.00	650-800	6.5		

However, other rubber materials have very different shrinkage rates and the deviations are large even if the same mold is used for production; of course, special molds can produce O-rings with precise dimensions to meet the precision requirements.

## Allowable Deviations for Shape and Surface Defects

O-rings can be divided into two types by shape and surface defects: Grade N and Grade S. The shape and surface defects of the O-rings are listed as follows:

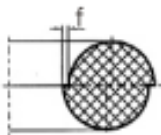
### Grade N

This type of O-Rings represents the standard quality, which is fully capable of meeting high quality requirements and daily applications.

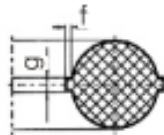
### Grade S

This type of O-Rings is suitable for applications with very high requirements for shape and surface defects, which usually require high production volume at a higher cost.

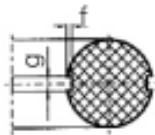
Off-register d



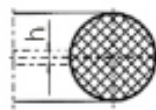
Excessive flash h



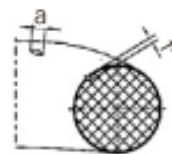
Backrind



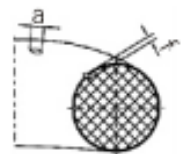
Excessive trimming



Flow mark



Other defects



## O-ring

			Grade	Allowable Cross-sectional Deviation $W$	
				Up to 2.65	>2.65
Off-register length	f	N	0.06	0.12	
Flash length		S	0.05	0.09	
Backrind	Width	g	N	0.1•W	0.1•W
	Depth	f		0.05	0.09
		g	S	0.05•W	0.05•W
		f		0.05	0.05
Excessive trimming width (excessive trimming is allowed, provided it is within the cross-sectional deviation range and the surface is smooth and clean)	h	N	0.04	1.2	
		S	0.04	0.7	
Flow mark (along the circumference)	Thickness	a	N	0.1•ID	0.1•ID
	Depth	f		0.03	0.06
	Thickness	a	S	0.05•ID	0.05•ID
	Depth	f		0.03	0.06
Other defects	Thickness	a	N	0.03•W	0.03•W
	Depth	f		0.05	0.09
	Thickness	a	S	0.1•W	0.1•W
	Depth	f		0.03	0.06
Surface roughness	$\mu\text{m}$	N	10	16	
		S	5	8	
Impurity		N	Allowable		
		S	Allowable		

When the methods of measuring deviations are identical, the only difference between the two types of O-rings is the accuracy range of deviations.

The accuracy range of deviations shown in the table depends on the accuracy control of the O-rings in the production process, and this range may vary.

# O-ring

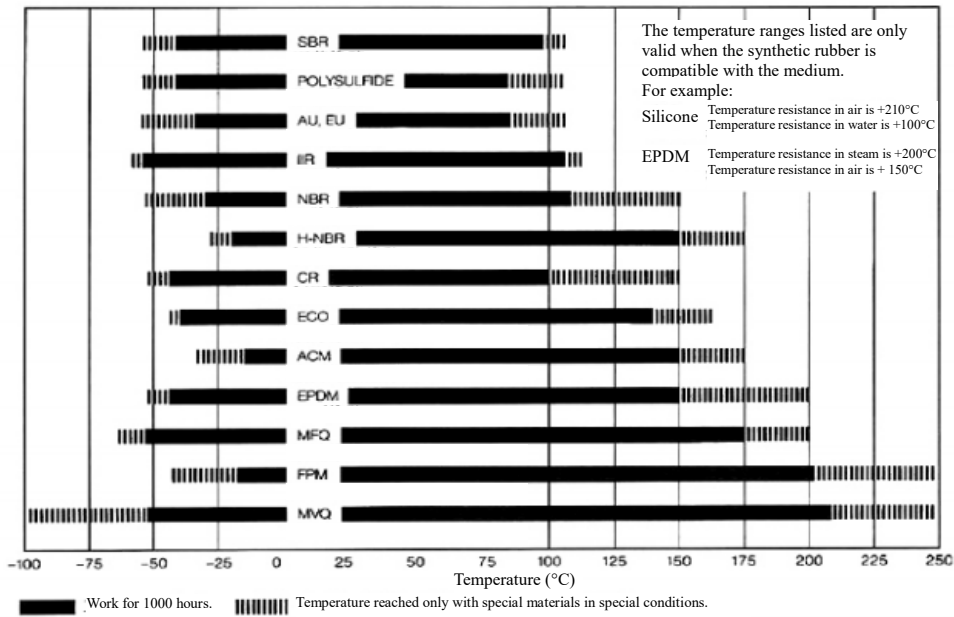
## Chemical properties of rubber materials:

	NR	IR	SBR	BR	IIR	EPD M	CR	NBR	PU	CSM	ACM	ECO	VAE	SI	FPM
Tensile Strength	◎	●	●	△	△	△	●	●	◎	●	▼	△	●	▼	●
Elongation	◎	◎	●	△	●	●	●	●	◎	●	▼	▼	▼	◎	▼
Rebound Resistance	◎	◎	△	◎	▼	●	◎	●	◎	△	△	△	△	△	△
Tear Resistance	◎	●	△	△	△	△	●	●	◎	△	▼	△	△	▼	△
Abrasion Resistance	◎	◎	◎	◎	◎	●	●	◎	◎	●	△	△	●	▼	△
Impact Strength Resistance	◎	◎	◎	●	●	●	◎	●	◎	●	▼	●	△	▼	△
Gas Impermeability Resistance	△	△	△	△	◎	△	◎	●	●	●	△	◎	●	▼	●
Oxygen Resistance	△	△	△	△	◎	●	●	△	●	◎	●	●	◎	◎	◎
Ozone Resistance	▼	▼	▼	▼	●	◎	●	▼	●	◎	●	◎	◎	◎	◎
Weathering Resistance	△	△	△	△	◎	◎	●	△	●	●	●	●	◎	◎	◎
Flame Resistance	▼	▼	△	△	◎	◎	●	▼	●	◎	●	●	◎	◎	◎
Heat Resistance	▼	▼	△	△	●	◎	●	△	△	●	●	●	●	◎	◎
Low Temperature Resistance	●	●	△	●	△	●	△	△	●	△	▼	●	●	◎	●
Oil and Fuel Resistance	▼	▼	▼	▼	▼	▼	■	●	●	■	●	●	△	△	◎
Animal and Vegetable oil Resistance	△	△	△	△	●	●	●	◎	●	●	◎	◎	△	■	◎
Alcohol Resistance	●	●	●	●	●	■	◎	●	■	◎	●	●	●	●	●
Alkaline Resistance	△	△	△	△	◎	●	◎	●	▼	◎	▼	■	●	▼	■
Acid Resistance	■	■	■	■	●	●	●	●	▼	●	△	△	△	△	●
Aliphatic-solvent Resistance															
-Aliphatic	▼	▼	▼	▼	▼	▼	●	◎	●	●	◎	●	△	▼	◎
-Aromatic	▼	▼	▼	▼	▼	▼	△	■	▼	△	△	●	▼	▼	◎
Oxygenated-solvent Resistance	●	●	●	●	◎	◎	▼	▼	▼	△	▼	▼	△	△	▼
Water Resistance	◎	◎	●	◎	◎	◎	●	●	△	●	▼	●	●	●	●

◎Excellent ●Good ■Suitable △Limited ▼Poor

# O-ring

## Synthetic rubber temperature range



## List of Rubber Materials

Note: Other hardness and materials are available for order






Synthetic Rubber Matrix	DIN ISO 1629	Shore A±5°	Scope of Application
Nitrile-butadiene rubber	NBR	70	Commonly used in hydraulic and pneumatic systems; suitable for hydraulic oil, water glycol (HFC) and oil-in-water emulsion (HFA), as well as animal oil, vegetable oil, fuel oil and heavy oil; resistant to methyl, ethyl, propyl and butane; and resistant to 70°C in water and 90°C in air.
		80	
		90	
	HNBR	75	Similar to NBR70 in performance. Resistant to 150°C in air; good mechanical properties; and resistant to mineral oil, hot water, ozone, and temperature.
Fluororubber	FPM	75	Resistant to high temperature, hot oils, aromatic solvents, many chemicals, and flame-resistant hydraulic fluids containing phosphate esters and chlorinated hydrocarbons.
		90	
Perfluoro rubber	FFKM	75	Excellent chemical resistance; wide range of operating temperatures, generally up to 260°C, with higher instantaneous temperature resistance.
Ethylene propylene diene monomer	EPDM	80	Resistant to steam (up to 200°C), hot water, hot gases (up to 150°C), weak acids, flame-resistant hydraulic fluids containing phosphate esters, and mineral oil-free brake fluids. Special note: EPDM is not applicable to mineral oils.
Silicone rubber	MVO	70	Colored O-ring material, resistant to high temperature (up to 210°C), oxygen, water (up to 100°C), for static seals only.
Chloroprene rubber	CR	70	Good resistance to aging and salt water, commonly used in the refrigeration industry (e.g. Freon 12).
Fluorinated silicone rubber	MFQ	70	Color O-ring material, good resistance to high and low temperatures, commonly used in applications requiring oil and flame resistance, such as aerospace.



## O-ring

### Failure Reasons and Countermeasures of O-rings for Dynamic Seal



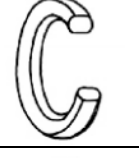
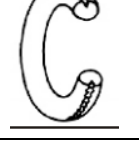


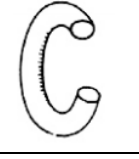
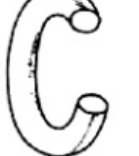
If leakage is found, please refer to the following table to observe the object, find out the cause, and take corresponding measures.

Appearance		Reason	Countermeasure
Fault	State		
Twist	The O-ring is twisted, deformed, and air leakage occurs.	 <ul style="list-style-type: none"> <li>① Too fast movement speed.</li> <li>② Eccentric motion.</li> <li>③ Ununiform roughness of sliding surface.</li> <li>④ Twisting during mounting.</li> </ul>	<ul style="list-style-type: none"> <li>① Change to lip seal.</li> <li>② Eliminate eccentric motion.</li> <li>③ Roughness of sliding surface should be 1.6S.</li> <li>④ Pay attention to mounting (apply grease).</li> </ul>
Stuck	The O-ring surface has local adhesion damage, and initial air leakage occurs.	 <ul style="list-style-type: none"> <li>① Defective holes, threaded parts and ends, etc. during mounting.</li> </ul>	<ul style="list-style-type: none"> <li>① Pay attention to chamfering at the end face. Use a mounting jig for mounting.</li> </ul>
Full circumferential wear	Wear occurs around the entire circumference of the O-ring, causing air leakage.	 <ul style="list-style-type: none"> <li>① Poor machining of sliding surface.</li> <li>② Lack of lubrication.</li> <li>③ Entering of foreign matters, such as dust and metal powder.</li> </ul>	<ul style="list-style-type: none"> <li>① The roughness of the sliding surface should be 1.6S.</li> <li>② Lubricate adequately.</li> <li>③ Remove foreign matters, and use filter or dustproof seal.</li> </ul>
Loss of elasticity	The O-ring cross-section is flattened and deformed in the groove.	 <ul style="list-style-type: none"> <li>① Use under repeated high temperature and low temperature conditions.</li> </ul>	<ul style="list-style-type: none"> <li>① Cool the sealing part.</li> </ul>
Local wear	Local wear occurs on the O-ring sliding surface, causing air leakage.	 <ul style="list-style-type: none"> <li>① Fitting sliding surface damaged.</li> </ul>	<ul style="list-style-type: none"> <li>① The roughness of the fitting sliding surface shall meet the regulations.</li> </ul>

## O-ring

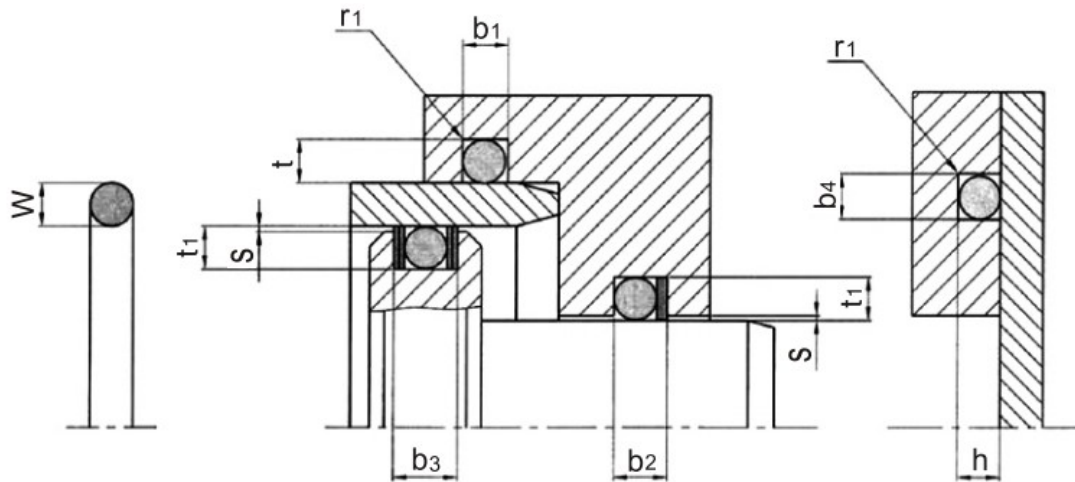
### Failure Reasons and Countermeasures of O-rings for Static Seal

If leakage is found, please refer to the following table to observe the object, find out the cause, and take corresponding measures.

Appearance			Reason	Countermeasure
Fault	State			
Hardening	It is bent and cracked when pressed forcibly		① The operating temperature exceeding the heat resistance limit of the rubber.	① Reduce the ambient temperature. ② Change to a material with good heat resistance.
Swelling	The O-ring becomes soft and swollen.		① The rubber material not suitable for sealing medium. ② Detergent residue left on it after cleaning with light oil, gasoline, etc.	① Re-select the rubber material. ② Remove the detergent.
Loss of elasticity	O-ring cross-section is flattened and deformed in the groove.		① Much cumulative effect of over compression, high temperature and sealing medium	① Re-select the groove dimensions and material.
Gap extrusion	All (or part of) the outer or inner circumference of the O-ring is squeezed and cut.		① Pressure or gap exceeding the limit, and effect of swelling.	① Ensure an appropriate gap or use a back-up ring. ② Re-select the rubber material.
Squeeze cracking	A small amount of the outer or inner circumference of the O-ring is alternately squeezed and cut off or a piece is dug out.		① Insufficient chamfering or rough assembly of cylindrical end or shaft end face. ② Inappropriate mounting in a state where the O-ring groove is shallower than the specified depth compared to the O-ring cross-sectional diameter.	① Perform suitable chamfering. ② Re-select the groove dimensions.
Ozone cracking	The surface of the O-ring is all cracked.		① Cracks occur on the surface due to ozone when the O-ring is exposed to the air in a tensioned state.	① Do not leave it in the air in a tensioned state. ② Apply grease or oil to the surface of the O-ring so that it is not directly exposed to the air.
Cracking	Cracks occur on the inner (outer) circumferential surface due to abrasion		① Inner (outer) circumference of the O-ring scratched by the thread tips when mounting the O-ring	① Use a protective jig during assembly so that the O-ring does not come into contact with the thread tips, etc.
Wear	Wear occurs in the O-ring contact area.		① Poor machining of the fitting surface in contact with the O-ring, and wear occurs due to pressure changes.	① Machine the fitting surface according to the required surface roughness.

# O-ring

## Recommended Groove Design for O-rings

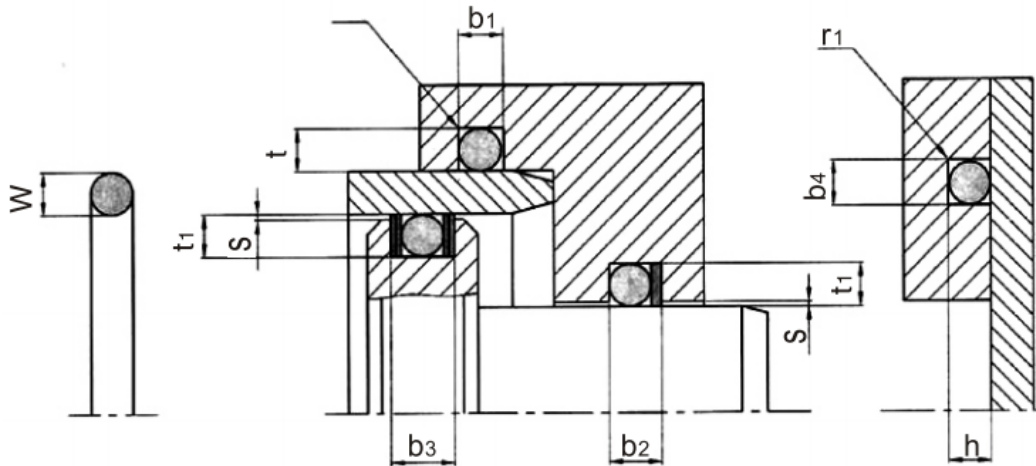


FOLON·A

Cross-sectional Diameter <i>W</i>	Radial Mounting					Axial Mounting		Chamfering Radius <i>r1</i>
	Groove Depth		Groove Width			Groove Depth	Groove Width	
	Dynamic Seal $t1+0.05$	Static Seal $t+0.05$	$b1+0.2$	$b2+0.2$	$b3+0.3$	$h+0.05$	$b4+0.2$	
0.5		0.35	0.80	-	-	0.35	0.80	0.20
0.74		0.50	1.00	-	-	0.50	1.00	0.20
1.00 1.02		0.70	1.40	-	-	0.70	1.40	0.20
1.2		0.85	1.70	-	-	0.85	1.70	0.20
1.25 1.27		0.90	1.70	-	-	0.90	1.80	0.20
1.3		0.95	1.80	-	-	0.95	1.80	0.20
1.42		1.05	1.90	-	-	1.05	2.00	0.30
1.50 1.52	1.25	1.10	2.00	3.00	4.00	1.10	2.10	0.30
1.60 1.63	1.30	1.20	2.10	3.10	4.10	1.20	2.20	0.30
1.78 1.80	1.45	1.30	2.40	3.80	5.20	1.30	2.60	0.40
1.83	1.50	1.35	2.50	3.90	5.30	1.35	2.60	0.40
1.9	1.55	1.40	2.60	4.00	5.40	1.40	2.70	0.40
1.98 2.00	1.65	1.50	2.70	4.10	5.50	1.50	2.80	0.40
2.08 2.10	1.75	1.55	2.80	4.20	5.60	1.55	2.90	0.40
2.2	1.85	1.60	3.00	4.40	5.80	1.65	3.00	0.40
2.26	1.90	1.70	3.00	4.40	5.80	1.70	3.10	0.40
2.30 2.34	1.95	1.75	3.10	4.50	5.90	1.75	3.10	0.40
2.4	2.05	1.80	3.20	4.60	6.00	1.80	3.30	0.50
2.46	2.10	1.85	3.30	4.70	6.10	1.85	3.40	0.50
2.5	2.15	1.85	3.30	4.70	6.10	1.85	3.40	0.50
2.62 2.65	2.25	2.00	3.60	5.00	6.40	2.00	3.80	0.60
2.7	2.30	2.05	3.60	5.00	6.40	2.05	3.80	0.60

# O-ring

## Recommended Groove Design for O-rings



Cross-sectional Diameter $W$	Radial Mounting					Axial Mounting		Chamfering Radius $r_1$
	Groove Depth		Groove Width			Groove Depth	Groove Width	
	Dynamic Seal $t_1+0.05$	Static Seal $t+0.05$	$b_1+0.2$	$b_2+0.2$	$b_3+0.3$	$h+0.05$	$b_4+0.2$	
2.80	2.40	2.10	3.70	5.10	6.50	2.10	3.90	0.60
2.92 2.95	2.50	2.20	3.90	5.30	6.70	2.20	4.00	0.60
3.00	2.60	2.30	4.00	5.40	6.80	2.30	4.00	0.60
3.10	2.70	2.40	4.10	5.50	6.90	2.40	4.10	0.60
3.50	3.05	2.65	4.60	6.00	7.40	2.65	4.70	0.60
3.53 3.55	3.10	2.70	4.80	6.20	7.60	2.70	5.00	0.80
3.60	3.15	2.80	4.80	6.20	7.60	2.80	5.10	0.80
4.00	3.50	3.10	5.20	6.90	8.60	3.10	5.30	0.80
4.50	4.00	3.50	5.80	7.50	9.20	3.50	5.90	0.80
5.00	4.40	4.00	6.60	8.30	10.22	4.00	6.70	0.80
5.33 5.30	4.70	4.30	7.10	8.80	10.50	4.30	7.30	1.20
5.50	4.80	4.50	7.10	8.80	10.50	4.50	7.30	1.20
5.70	5.00	4.60	7.20	8.90	10.60	4.60	7.40	1.20
6.00	5.30	4.90	7.40	9.10	10.80	4.90	7.60	1.20
6.50	5.70	5.40	8.00	9.70	11.40	5.40	8.20	1.20
6.99 7.00	6.10	5.80	9.50	12.00	14.50	5.80	9.70	1.50
7.50	6.60	6.30	9.70	12.20	14.70	6.30	9.90	1.50
8.00	7.10	6.70	9.80	12.30	14.80	6.70	10.00	1.50
8.40	7.50	7.10	10.00	12.50	15.00	7.10	10.30	1.50
9.00	8.10	7.70	10.60	13.10	15.60	7.70	10.90	2.00
9.50	8.60	8.20	11.00	13.50	16.00	8.20	11.40	2.00
10.00	9.10	8.60	11.60	14.10	16.60	8.60	12.00	2.50
12.00	11.00	10.60	13.50	16.00	18.50	10.60	14.00	2.50

## O-ring

### AS 568

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
001	0.74	1.02	031	44.17	1.78	112	12.37	2.62	142	59.99	2.62
002	1.07	1.27	032	47.35	1.78	113	13.94	2.62	143	61.60	2.62
003	1.42	1.52	033	50.52	1.78	114	15.54	2.62	144	63.17	2.62
004	1.78	1.78	034	53.70	1.78	115	17.12	2.62	145	64.77	2.62
005	2.57	1.78	035	56.87	1.78	116	18.72	2.62	146	66.34	2.62
006	2.90	1.78	036	60.05	1.78	117	20.29	2.62	147	67.95	2.62
007	3.68	1.78	037	63.22	1.78	118	21.89	2.62	148	69.52	2.62
008	4.47	1.78	038	66.40	1.78	119	23.47	2.62	149	71.12	2.62
009	5.28	1.78	039	69.57	1.78	120	25.07	2.62	150	72.69	2.62
010	6.07	1.78	040	72.75	1.78	121	26.64	2.62	151	75.87	2.62
011	7.65	1.78	041	75.92	1.78	122	28.24	2.62	152	82.22	2.62
012	9.25	1.78	042	82.27	1.78	123	29.82	2.62	153	88.57	2.62
013	10.82	1.78	043	88.62	1.78	124	31.42	2.62	154	94.92	2.62
014	12.42	1.78	044	94.97	1.78	125	32.99	2.62	155	101.27	2.62
015	14.00	1.78	045	101.32	1.78	126	34.59	2.62	156	107.67	2.62
016	15.60	1.78	046	107.67	1.78	127	36.17	2.62	157	113.97	2.62
017	17.17	1.78	047	114.02	1.78	128	37.77	2.62	158	120.32	2.62
018	18.77	1.78	048	120.37	1.78	129	39.34	2.62	159	126.67	2.62
019	20.35	1.78	049	126.72	1.78	130	40.94	2.62	160	133.02	2.62
020	21.95	1.78	050	133.07	1.78	131	42.52	2.62	161	139.37	2.62
			W=2.62								
021	23.52	1.78	102	1.24	2.62	132	44.12	2.62	162	145.72	2.62
022	25.12	1.78	103	2.06	2.62	133	45.69	2.62	163	152.07	2.62
023	26.70	1.78	104	2.84	2.62	134	47.29	2.62	164	158.42	2.62
024	28.30	1.78	105	3.63	2.62	135	48.90	2.62	165	164.77	2.62
025	29.87	1.78	106	4.42	2.62	136	50.47	2.62	166	171.12	2.62
026	31.47	1.78	107	5.23	2.62	137	52.07	2.62	167	177.47	2.62
027	33.05	1.78	108	6.02	2.62	138	53.64	2.62	168	183.82	2.62
028	34.65	1.78	109	7.59	2.62	139	55.25	2.62	169	190.17	2.62
029	37.82	1.78	110	9.19	2.62	140	56.82	2.62	170	196.52	2.62
030	41.00	1.78	111	10.77	2.62	141	58.42	2.62	171	202.87	2.62

## O-ring

### AS 568

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
172	209.22×2.62		221	36.09×3.53		251	129.77×3.53		281	380.59×3.53	
173	215.57×2.62		222	37.69×3.53		252	132.94×3.53		282	405.26×3.53	
174	221.92×2.62		223	40.87×3.53		253	136.12×3.53		283	430.66×3.53	
175	228.27×2.62		224	44.04×3.53		254	139.29×3.53		284	456.06×3.53	
176	234.62×2.62		225	47.22×3.53		255	142.47×3.53				
									W= 5.33		
177	240.97×2.62		226	50.39×3.53		256	145.64×3.53		309	10.46×5.33	
178	247.32×2.62		227	53.57×3.53		257	148.82×3.53		310	12.07×5.33	
179	253.67×2.62		228	56.74×3.53		258	151.99×3.53		311	13.64×5.33	
			229	59.92×3.53		259	158.34×3.53		312	15.24×5.33	
			230	63.09×3.53		260	164.69×3.53		313	16.81×5.33	
		W= 3.53									
201	4.34×3.53		231	66.27×3.53		261	171.04×3.53		314	18.42×5.33	
202	5.94×3.53		232	69.44×3.53		262	177.39×3.53		315	19.99×5.33	
203	7.52×3.53		233	72.62×3.53		263	183.74×3.53		316	21.59×5.33	
204	9.12×3.53		234	75.79×3.53		264	190.09×3.53		317	23.16×5.33	
205	10.69×3.53		235	78.97×3.53		265	198.44×3.53		318	24.77×5.33	
206	12.29×3.53		236	82.14×3.53		266	202.79×3.53		319	26.34×5.33	
207	13.87×3.53		237	85.32×3.53		267	209.14×3.53		320	27.94×5.33	
208	15.47×3.53		238	88.49×3.53		268	215.49×3.53		321	29.51×5.33	
209	17.04×3.53		239	91.67×3.53		269	221.84×3.53		322	31.12×5.33	
210	18.64×3.53		240	94.84×3.53		270	228.19×3.53		323	32.69×5.33	
211	20.22×3.53		241	98.02×3.53		272	240.89×3.53		324	34.29×5.33	
212	21.82×3.55		242	101.19×3.53		273	247.24×3.53		325	37.47×5.33	
213	23.39×3.53		243	104.37×3.53		274	253.59×3.53		326	40.64×5.33	
214	24.99×3.53		244	107.54×3.53		275	266.29×3.53		327	43.82×5.33	
215	26.57×3.53		245	110.72×3.53		271	234.54×3.53		328	46.99×5.33	
216	28.17×3.53		246	113.89×3.53		276	278.99×3.53		329	50.17×5.33	
217	29.74×3.53		247	117.07×3.53		277	291.09×3.53		330	53.34×5.33	
218	31.34×8.53		248	120.24×3.53		278	304.39×3.53		331	56.52×5.33	
219	32.92×3.53		249	123.42×3.53		279	329.79×3.53		332	59.69×5.33	
220	34.52×3.53		250	126.59×3.53		280	355.19×3.53		333	62.87×5.33	

## O-ring

### AS 568

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
334	66.04×5.33		364	170.82×5.33		394	633.48×5.33		450	266.07×6.99	
335	69.22×5.33		365	177.17×5.33		395	658.88×5.33		451	278.77×6.99	
336	72.39×5.33		366	183.52×5.33					452	291.47×6.99	
337	75.57×5.33		367	189.87×5.33					453	304.17×6.99	
338	78.74×5.33		368	196.22×5.33					454	316.87×6.99	
W= 6.99											
339	81.92×5.33		369	202.57×5.33		425	113.67×6.99		455	329.57×6.99	
340	85.09×5.33		370	208.92×5.33		426	116.84×6.99		456	342.27×6.99	
341	88.27×5.33		371	215.27×5.33		427	120.02×6.99		457	354.97×6.99	
342	91.44×5.33		372	221.62×5.33		428	123.19×6.99		458	367.67×6.99	
343	94.62×5.33		373	227.97×5.33		429	126.37×6.99		459	380.37×6.99	
344	97.79×5.33		374	234.32×5.33		430	129.54×6.99		460	393.07×6.99	
345	100.97×5.33		375	240.67×5.33		431	132.72×6.99		461	405.26×6.99	
346	104.14×5.33		376	247.02×5.33		432	135.89×6.99		462	417.96×6.99	
347	107.32×5.33		377	253.37×5.33		433	139.07×6.99		463	430.66×6.99	
348	110.49×5.33		378	266.07×5.33		434	142.24×6.99		464	443.36×6.99	
349	113.67×5.33		379	278.77×5.33		435	145.42×6.99		465	456.06×6.99	
350	116.84×5.33		380	291.47×5.33		436	148.59×6.99		466	468.76×6.99	
351	120.02×5.33		381	304.17×5.33		437	151.77×6.99		467	481.46×6.99	
352	123.19×5.33		382	329.57×5.33		438	158.12×6.99		468	494.16×6.99	
353	126.37×5.33		383	354.97×5.33		439	164.47×6.99		469	506.86×6.99	
354	129.54×5.33		384	380.37×5.33		440	170.82×6.99		470	532.26×6.99	
355	132.72×5.33		385	405.26×5.33		441	177.17×6.99		471	557.66×6.99	
356	135.89×5.33		386	430.66×5.33		442	183.52×6.99		472	582.68×6.99	
357	139.07×5.33		387	456.06×5.33		443	189.87×6.99		473	608.08×6.99	
358	142.24×5.33		388	481.41×5.33		444	196.22×6.99		474	633.48×6.99	
359	145.42×5.33		389	506.81×5.33		445	202.57×6.99		475	658.88×6.99	
360	148.59×5.33		390	532.21×5.33		446	215.27×6.99				
361	151.77×5.33		391	557.61×5.33		447	227.97×6.99				
362	158.12×5.33		392	582.68×5.33		448	240.67×6.99				
363	164.47×5.33		393	608.08×5.33		449	253.37×6.99				

## O-ring

### AS 568

### French standard (R)

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
901	4.70×1.42		R-0	2.40×1.9		28	37.47×5.34		58	129.54×6.99	
902	6.07×1.63		1	2.60×1.9		29	40.65×5.34		59	132.72×6.99	
903	7.65×1.63		2	3.40×1.9		30	43.82×5.34		60	135.90×6.99	
904	8.92×1.83		3	4.20×1.9		31	47.00×5.34		61	139.07×6.99	
905	10.52×1.83		4	4.90×1.9		32	50.16×5.34		62	142.24×6.99	
906	11.89×1.98		5	5.70×1.9		33	53.34×5.34		63	145.42×6.99	
907	13.46×2.08		5a	6.40×1.9		34	56.52×5.34		64	148.60×6.99	
908	16.36×2.21		6	7.20×1.9		35	59.70×5.34		65	151.77×6.99	
909	17.93×2.46		6a	8.00×1.9		36	62.87×5.34		66	158.12×6.99	
910	19.18×2.46		7	8.90×1.9		37	66.04×5.34		67	164.47×6.99	
911	21.92×2.95		8	8.90×2.7		38	69.22×5.34		68	170.82×6.99	
912	23.47×2.95		9	10.50×2.7		39	72.40×5.34		69	177.17×6.99	
913	25.04×2.95		10	12.10×2.7		40	75.57×5.34		70	183.52×6.99	
914	26.59×2.95		11	13.00×2.7		41	78.74×5.34		71	189.87×6.99	
916	29.74×2.95		12	15.10×2.7		42	81.92×5.34		72	196.22×6.99	
918	34.42×2.95		13	16.90×2.7		43	85.09×5.34		73	202.57×6.99	
920	37.47×3.00		14	18.40×2.7		44	88.27×5.34		74	215.27×6.99	
924	43.69×3.00		15	18.30×3.6		45	91.44×5.34		75	227.97×6.99	
928	53.09×3.00		16	19.80×3.6		46	94.62×5.34		76	240.67×6.99	
932	59.36×3.00		17	21.30×3.6		47	97.80×5.34		77	253.37×6.99	
			18	23.00×3.6		48	100.97×5.34		78	266.07×6.99	
			19	24.60×3.6		49	104.14×5.34		79	278.77×6.99	
			20	26.20×3.6		50	107.32×5.34		80	291.47×6.99	
			21	27.80×3.6		51	110.49×5.34		81	304.17×6.99	
			22	29.30×3.6		52	113.67×5.34		82	316.87×6.99	
			23	30.80×3.6		53	113.67×6.99		83	329.57×6.99	
			24	32.50×3.6		54	116.84×6.99		84	342.27×6.99	
			25	34.10×3.6		55	120.02×6.99		85	354.97×6.99	
			26	35.60×3.6		56	123.20×6.99		86	367.67×6.99	
			27	37.30×3.6		57	126.37×6.99		87	380.37×6.99	

FOLON-A



# O-ring

## BS 1516

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
88	393.07	6.99	1	2.90	1.78	31	46.99	5.34	61	142.24	6.99
			2	3.68	1.78	32	50.16	5.34	62	145.42	6.99
			3	4.47	1.78	33	53.34	5.34	63	148.59	6.99
			4	5.28	1.78	34	56.52	5.34	64	151.76	6.99
			5	6.07	1.78	35	59.69	5.34	65	158.12	6.99
			7	7.65	1.78	36	62.86	5.34	66	164.46	6.99
			6	9.25	1.78	37	66.07	5.34	67	170.82	6.99
			8	9.19	2.62	38	69.22	5.34	68	177.16	6.99
			9	10.77	2.62	39	72.39	5.34	69	183.52	6.99
			10	12.37	2.62	40	75.56	5.34	70	189.86	6.99
			11	13.94	2.62	41	78.74	5.34	71	196.22	6.99
			12	15.54	2.62	42	81.92	5.34	72	202.56	6.99
			13	17.12	2.62	43	85.09	5.34	73	215.26	6.99
			14	18.72	2.62	44	88.26	5.34	74	227.96	6.99
			15	18.64	3.53	45	91.44	5.34	75	240.66	6.99
			16	20.22	3.53	46	94.62	5.34	76	253.36	6.99
			17	21.82	3.53	47	97.79	5.34	77	266.06	6.99
			18	23.39	3.53	48	100.96	5.34	78	278.76	6.99
			19	24.99	3.53	49	104.14	5.34	79	291.46	6.99
			20	26.57	3.53	50	107.32	5.34	80	304.16	6.99
			21	28.17	3.53	51	110.49	5.34	81	316.86	6.99
			22	29.74	3.53	52	113.66	5.34	82	329.56	6.99
			23	31.34	3.53	53	116.84	6.99	83	342.26	6.99
			24	32.92	3.53	54	120.02	6.99	84	354.96	6.99
			25	34.52	3.53	55	123.19	6.99	85	367.66	6.99
			26	36.09	3.53	56	126.36	6.99	86	380.36	6.99
			27	37.69	3.53	57	129.54	6.99	87	393.06	6.99
			28	37.46	5.34	58	132.72	6.99	88	413.60	6.99
			29	40.64	5.34	59	135.89	6.99			
			30	43.82	5.34	60	139.06	6.99			

FOLON-A

# O-ring

## JIS B2401

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
P3	2.8×1.9		P31	30.7×3.5		P70	69.6×5.7		P195	194.5×8.4	
P4	3.8×1.9		P31.5	31.2×3.5		P71	70.6×5.7		P200	199.5×8.4	
P5	4.8×1.9		P32	31.7×3.5		P75	74.6×5.7		P205	204.5×8.4	
P6	5.8×1.9		P34	33.7×3.5		P80	79.6×5.7		P209	208.5×8.4	
P7	6.8×1.9		P35	34.7×3.5		P85	84.6×5.7		P210	209.5×8.4	
P8	7.8×1.9		P35.5	35.2×3.5		P90	89.6×5.7		P215	214.5×8.4	
P9	8.8×1.9		P36	35.7×3.5		P95	94.6×5.7		P220	219.5×8.4	
P10	9.8×1.9		P38	37.7×3.5		P100	99.6×5.7		P225	224.5×8.4	
P10A	9.8×2.4		P39	38.7×3.5		P102	101.6×5.7		P230	229.5×8.4	
P11	10.8×2.4		P40	39.7×3.5		P105	104.6×5.7		P235	234.5×8.4	
P11.5	11.0×2.4		P41	40.7×3.5		P110	109.6×5.7		P240	239.5×8.4	
P12	11.8×2.4		P42	41.7×3.5		P112	111.6×5.7		P245	244.5×8.4	
P12.5	12.3×2.4		P44	43.7×3.5		P115	114.6×5.7		P250	249.5×8.4	
P14	13.8×2.4		P45	44.7×3.5		P120	119.6×5.7		P255	254.5×8.4	
P15	14.8×2.4		P46	45.7×3.5		P125	124.6×5.7		P260	259.5×8.4	
P16	15.8×2.4		P48	47.7×3.5		P130	129.6×5.7		P265	264.5×8.4	
P18	17.8×2.4		P49	48.7×3.5		P132	131.6×5.7		P270	269.5×8.4	
P20	19.8×2.4		P50	49.7×3.5		P135	134.6×5.7		P275	274.5×8.4	
P21	20.8×2.4		P48A	47.6×5.7		P140	139.6×5.7		P280	279.5×8.4	
P22	21.8×2.4		P50A	49.6×5.7		P145	144.6×5.7		P285	284.5×8.4	
P22A	21.7×3.5		P52	51.6×5.7		P150	149.6×5.7		P290	289.5×8.4	
P22.4	22.1×3.5		P53	52.6×5.7		P150A	149.5×8.4		P295	294.5×8.4	
P24	23.7×3.5		P55	54.6×5.7		P155	154.5×8.4		P300	299.5×8.4	
P25	24.7×3.5		P56	55.6×5.7		P160	159.5×8.4		P315	314.5×8.4	
P25.5	25.2×3.5		P58	57.6×5.7		P165	164.5×8.4		P320	319.5×8.4	
P26	25.7×3.5		P60	59.6×5.7		P170	169.5×8.4		P335	334.5×8.4	
P28	27.7×3.5		P62	61.6×5.7		P175	174.5×8.4		P340	339.5×8.4	
P29	28.7×3.5		P63	62.6×5.7		P180	179.5×8.4		P335	354.5×8.4	
P29.5	29.2×3.5		P65	64.6×5.7		P185	184.5×8.4		P360	359.5×8.4	
P30	29.7×3.5		P67	66.6×5.7		P190	189.5×8.4		P375	374.5×8.4	

## O-ring

### JIS B2401

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W	
P385	384.5	8.4	G25	24.4	3.1	G175	174.3	5.7	S3		2.5	1.5
P400	399.5	8.4	G30	29.4	3.1	G180	179.3	5.7	S4		3.5	1.5
			G35	34.4	3.1	G185	184.3	5.7	S5		4.5	1.5
			G40	39.4	3.1	G190	189.3	5.7	S6		5.5	1.5
			G45	44.4	3.1	G195	194.3	5.7	S7		6.5	1.5
			G50	49.4	3.1	G200	199.3	5.7	S8		7.5	1.5
			G55	54.4	3.1	G210	209.3	5.7	S9		8.5	1.5
			G60	59.4	3.1	G220	219.3	5.7	S10		9.5	1.5
			G65	64.4	3.1	G230	229.3	5.7	S11.2		10.7	1.5
			G70	69.4	3.1	G240	239.3	5.7	S12		11.5	1.5
			G75	74.4	3.1	G250	249.3	5.7	S12.5		12.0	1.5
			G80	79.4	3.1	G260	259.3	5.7	S14		13.5	1.5
			G85	84.4	3.1	G270	269.3	5.7	S15		14.5	1.5
			G90	89.4	3.1	G280	279.3	5.7	S16		15.5	1.5
			G95	94.4	3.1	G290	289.3	5.7	S18		17.5	1.5
			G100	99.4	3.1	G300	299.3	5.7	S20		19.5	1.5
			G105	104.4	3.1				S22		21.5	1.5
			G110	109.4	3.1				S22.4		21.9	2.0
			G115	114.4	3.1				S24		23.5	2.0
			G120	119.4	3.1				S25		24.5	2.0
			G125	124.4	3.1				S26		25.5	2.0
			G130	129.4	3.1				S28		27.5	2.0
			G135	134.4	3.1				S29		28.5	2.0
			G140	139.4	3.1				S30		29.5	2.0
			G145	144.4	3.1				S31.5		31.0	2.0
			G150	149.3	5.7				S32		31.5	2.0
			G155	154.3	5.7				S34		33.5	2.0
			G160	159.3	5.7				S35		34.5	2.0
			G165	164.3	5.7				S35.5		35.0	2.0
			G170	169.3	5.7				S36		35.5	2.0

# O-ring

## JIS B2401

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
S38	37.5	2.0	S130	129.5	2.0	SS2	1.8	1.0	V15	14.5	4.0
S39	38.5	2.0	S132	131.5	2.0	SS2.5	2.0	1.0	V24	23.5	4.0
S40	39.5	2.0	S135	134.5	2.0	SS3	2.5	1.0	V34	33.5	4.0
S42	41.5	2.0	S140	139.5	2.0	SS3.5	3.0	1.0	V40	39.5	4.0
S44	43.5	2.0	S145	144.5	2.0	SS4	3.5	1.0	V55	54.5	4.0
S45	44.5	2.0	S150	149.5	2.0						
S45	44.5	2.0	S150	149.5	2.0	SS4.5	4.0	1.0	V70	69.0	4.0
S46	44.5	2.0				SS5	4.5	1.0	V85	84.0	4.0
S48	47.5	2.0				SS5.5	5.0	1.0	V100	99.0	4.0
S50	49.5	2.0				SS6	5.5	1.0	V120	119.0	4.0
S53	52.5	2.0				Ss6.5	6.0	1.0	V150	148.5	4.0
S55	54.5	2.0				SS7	6.5	1.0	V175	173.0	4.0
S56	55.5	2.0				SS7.5	7.0	1.0	V225	222.5	6.0
S60	59.5	2.0				SS8	7.5	1.0	V275	272.0	6.0
S63	62.5	2.0				SS8.5	8.0	1.0	V325	321.5	6.0
S65	64.5	2.0				SS9	8.5	1.0	V380	376.0	6.0
S67	66.5	2.0				559.5	9.0	1.0	V430	425.5	6.0
S70	69.5	2.0				5510	9.5	1.0	V480	475.0	10.0
S71	70.5	2.0				5510.5	10.0	1.0	V530	524.5	10.0
S75	74.5	2.0				5511	10.5	1.0	V585	579.0	10.0
S80	79.5	2.0				5511.5	11.0	1.0	V640	633.5	10.0
S85	84.5	2.0				SS12	11.5	1.0	V690	683.0	10.0
S90	89.5	2.0							V740	732.5	10.0
S95	94.5	2.0							V790	782.0	10.0
S100	99.5	2.0							V845	836.5	10.0
S105	104.5	2.0							V950	940.5	10.0
S110	109.5	2.0							V1055	1044.0	10.0
S112	111.5	2.0									
S115	114.5	2.0									
S120	119.5	2.0									
S125	124.5	2.0									

## O-ring

### DINISO 3601

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
	1.80	1.80		12.50	1.80		19.00	3.55		58.00	3.55
	2.00	1.80		13.20	1.80		20.00	3.55		60.00	3.55
	2.24	1.80		14.00	1.80		21.20	3.55		61.50	3.55
	2.50	1.80		15.00	1.80		22.40	3.55		63.00	3.55
	2.80	1.80		16.00	1.80		23.60	3.55		65.00	3.55
	3.15	1.80		17.00	1.80		25.80	3.55		67.00	3.55
	3.55	1.80		14.00	2.65		26.50	3.55		69.00	3.55
	3.75	1.80		15.00	2.65		28.00	3.55		71.00	3.55
	4.00	1.80		16.00	2.65		30.00	3.55		73.00	3.55
	4.50	1.80		17.00	2.65		31.50	3.55		75.00	3.55
	4.87	1.80		18.00	2.65		32.50	3.55		77.50	3.55
	5.00	1.80		19.00	2.65		33.50	3.55		82.50	3.55
	5.15	1.80		20.00	2.65		34.50	3.55		85.00	3.55
	5.30	1.80		21.20	2.65		35.50	3.55		87.50	3.55
	5.60	1.80		22.40	2.65		36.50	3.55		90.00	3.55
	6.00	1.80		23.60	2.65		37.50	3.55		92.50	3.55
	6.30	1.80		25.00	2.65		38.70	3.55		95.00	3.55
	6.70	1.80		25.80	2.65		40.00	3.55		97.50	3.55
	6.90	1.80		26.50	2.65		41.20	3.55		100.00	3.55
	7.10	1.80		28.00	2.65		42.50	3.55		103.00	3.55
	7.50	1.80		30.00	2.65		43.70	3.55		106.00	3.55
	8.00	1.80		31.50	2.05		45.00	3.55		109.00	3.55
	8.50	1.80		32.50	2.65		46.20	3.55		112.00	3.55
	8.76	1.80		33.50	2.65		47.50	3.55		115.00	3.55
	9.00	1.80		34.50	2.65		48.70	3.55		118.00	3.55
	9.50	1.80		35.50	2.65		50.00	3.55		122.00	3.55
	10.00	1.80		36.50	2.65		51.50	3.55		125.00	3.55
	10.60	1.80		37.50	2.65		53.00	3.55		128.00	3.55
	11.20	1.80		38.70	2.65		54.50	3.55		132.00	3.55
	11.80	1.80		18.00	3.55		56.00	3.55		136.00	3.55

## O-ring

### DINISO 3601

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
	140.00	3.55		65.00	5.30		155.00	5.30		365.00	5.30
	145.00	3.55		67.00	5.30		160.00	5.30		375.00	5.30
	150.00	3.55		69.00	5.30		165.00	5.30		387.00	5.30
	155.00	3.55		71.00	5.30		170.00	5.30		400.00	5.30
	160.00	3.55		73.00	5.30		175.00	5.30		109.00	7.00
	165.00	3.55		75.00	5.30		180.00	5.30		112.00	7.00
	170.00	3.55		77.50	5.30		185.00	5.30		115.00	7.00
	175.00	3.55		80.00	5.30		190.00	5.30		118.00	7.00
	180.00	3.55		82.50	5.30		195.00	5.30		122.00	7.00
	185.00	3.55		85.00	5.30		200.00	5.30		125.00	7.00
	190.00	3.55		87.50	5.30		206.00	5.30		128.00	7.00
	195.00	3.55		90.00	5.30		212.00	5.30		132.00	7.00
	200.00	3.55		92.50	5.30		218.00	5.30		136.00	7.00
	40.00	5.30		95.00	5.30		224.00	5.30		140.00	7.00
	41.20	5.30		97.50	5.30		230.00	5.30		145.00	7.00
	42.50	5.30		100.00	5.30		236.00	5.30		150.00	7.00
	43.70	5.30		103.00	5.30		243.00	5.30		155.00	7.00
	45.00	5.30		106.00	5.30		250.00	5.30		160.00	7.00
	46.20	5.30		109.00	5.30		258.00	5.30		165.00	7.00
	47.50	5.30		112.00	5.30		265.00	5.30		170.00	7.00
	48.70	5.30		115.00	5.30		272.00	5.30		175.00	7.00
	50.00	5.30		118.00	5.30		280.00	5.30		180.00	7.00
	51.50	5.30		122.00	5.30		290.00	5.30		185.00	7.00
	53.00	5.30		125.00	5.30		300.00	5.30		190.00	7.00
	54.50	5.30		128.00	5.30		307.00	5.30		195.00	7.00
	56.00	5.30		132.00	5.30		315.00	5.30		200.00	7.00
	58.00	5.30		136.00	5.30		325.00	5.30		206.00	7.00
	60.00	5.30		140.00	5.30		335.00	5.30		212.00	7.00
	61.50	5.30		145.00	5.30		345.00	5.30		218.00	7.00
	63.00	5.30		150.00	5.30		355.00	5.30		224.00	7.00

## O-ring

### DINISO 3601

Model	ID	W	Model	ID	W	Model	ID	W	Model	ID	W
	230.00	7.00		545.00	7.00						
	236.00	7.00		560.00	7.00						
	243.00	7.00		580.00	7.00						
	250.00	7.00		600.00	7.00						
	258.00	7.00		615.00	7.00						
	265.00	7.00		630.00	7.00						
	272.00	7.00		650.00	7.00						
	280.00	7.00		670.00	7.00						
	290.00	7.00									
	300.00	7.00									
	307.00	7.00									
	315.00	7.00									
	325.00	7.00									
	335.00	7.00									
	345.00	7.00									
	355.00	7.00									
	365.00	7.00									
	375.00	7.00									
	387.00	7.00									
	400.00	7.00									
	412.00	7.00									
	425.00	7.00									
	437.00	7.00									
	450.00	7.00									
	462.00	7.00									
	475.00	7.00									
	487.00	7.00									
	500.00	7.00									
	515.00	7.00									
	530.00	7.00									

# O-ring

## O-ring Boxes:

We also provide O-ring kits for daily service and repair. The kits contain some of the most commonly used O-ring types for your selection.

Materials: NBR70, NBR90, and FKM80. Other specifications and materials are available for order.

### BOX A British size

<b>Box A: 70 Shore A O-rings of 30 sizes = 382 pieces</b>				
20×2.90×1.78 ARP/BS006	20×3.68×1.78 ARP/BS007	20×4.47×1.78 ARP/BS008	20×5.28×1.78 ARP/BS009	20×6.07×1.78 ARP/BS010
20×7.65×1.78 ARP/BS011	20×9.25×1.78 ARP/BS012	13×9.19×2.62 ARP/BS110	13×10.77×2.62 ARP/BS111	13×12.37×2.62 ARP/BS112
13×13.94×2.62 ARP/BS113	13×15.54×2.62 ARP/BS114	13×17.12×2.62 ARP/BS115	13×18.72×2.62 ARP/BS116	10×18.64×3.53 ARP/BS210
10×20.22×3.53 ARP/BS211	10×21.82×3.53 ARP/BS212	10×23.40×3.53 ARP/BS213	10×24.99×3.53 ARP/BS214	10×26.58×3.53 ARP/BS215
10×28.17×3.53 ARP/BS216	10×29.74×3.53 ARP/BS217	10×31.34×3.53 ARP/BS218	10×32.92×3.53 ARP/BS219	10×34.52×3.53 ARP/BS220
10×36.09×3.53 ARP/BS221	10×37.69×3.53 ARP/BS222	7×37.47×5.33 ARP/BS325	7×40.64×5.33 ARP/BS326	7×43.82×5.33 ARP/BS327

### BOX B Japanese size

<b>Box B: 70 Shore A O-rings of 30 sizes = 391 pieces</b>					
18×2.8×1.9 P3	18×3.8×1.9 P4	18×4.8×1.9 P5	18×5.8×1.9 P6	18×6.8×1.9 P7	18×7.8×1.9 P8
18×8.8×1.9 P9	14×9.8×1.9 P10A	14×10.8×2.4 P11	14×11.8×2.4 P12	14×13.8×2.4 P14	14×15.8×2.4 P16
14×17.8×1.9 P18	14×19.8×2.4 P20	11×20.8×2.4 P21	11×21.8×2.4 P22	10×22.1×3.5 P22.4	11×24.4×3.1 G25
10×24.7×3.5 P25	10×25.7×3.5 P26	11×29.4×3.1 G30	10×29.7×3.5 P30	10×31.7×3.5 P32	10×33.7×3.5 P34
11×34.4×3.1 G35	10×35.7×3.5 P36	11×39.4×3.1 G40	10×39.7×3.5 P40	11×44.4×3.1 G45	10×47.7×3.5 P48



## O-ring

### BOX C metric size

<b>Box C: 70 Shore A O-rings of 30 sizes = 386 pieces</b>				
16×3×2	16×4×2	16×5×2	16×6×2	16×7×2
16×8×2	16×10×2	13×10×2.5	13×11×2.5	13×12×2.5
13×14×2.5	13×16×2.5	13×17×2.5	13×19×2.5	12×19×3
12×20×3	12×22×3	12×24×3	12×25×3	12×27×3
12×28×3	12×30×3	12×32×3	12×33×3	12×35×3
12×36×3	12×38×3	9×38×4	9×41×4	9×44×4

### BOX D ISO size

<b>Box D: 30 Shore A O-rings of 30 sizes = 372 pieces</b>					
18×3.15×1.8	18×3.75×1.8	18×4.5×1.8	18×5.3×1.8	18×6×1.8	18×7.5×1.8
18×9.5×1.8	12×10×2.65	12×11.2×2.65	12×13.2×2.65	12×14×2.65	12×16×2.65
12×17×2.65	12×19×2.65	12×20×2.65	10×20×3.55	10×21.2×3.55	10×22.4×3.55
10×25×3.55	10×26.5×3.55	10×28×3.55	10×30×3.55	10×31.5×3.55	10×32.5×3.55
10×34.5×3.55	10×35.5×3.55	10×37.5×3.55	10×40×3.55	10×43.7×3.55	10×46.2×3.55

## O-ring

### BOX E British size

<b>Box E: 70 Shore A O-rings of 30 sizes = 340 pieces</b>				
20×2.90×1.78 ARP/BS006	20×3.68×1.78 ARP/BS007	20×4.47×1.78 ARP/BS008	20×5.28×1.78 ARP/BS009	20×6.07×1.78 ARP/BS010
20×7.65×1.78 ARP/BS011	20×9.25×1.78 ARP/BS012	13×10.82×1.78 ARP/BS013	15×12.42×1.78 ARP/BS014	10×14.00×1.78 ARP/BS015
10×15.60×1.78 ARP/BS016	5×17.17×1.78 ARP/BS017	5×18.77×1.78 ARP/BS018	5×9.19×2.62 ARP/BS110	5×10.77×2.62 ARP/BS111
15×12.37×2.62 ARP/BS112	15×13.94×2.62 ARP/BS113	10×15.54×2.62 ARP/BS114	10×17.12×2.62 ARP/BS115	10×18.72×2.62 ARP/BS116
5×20.29×2.62 ARP/BS117	5×21.89×2.62 ARP/BS118	5×23.47×2.62 ARP/BS119	5×18.64×3.53 ARP/BS210	5×20.22×3.53 ARP/BS211
5×21.82×3.53 ARP/BS212	5×23.39×3.53 ARP/BS213	5×24.99×3.53 ARP/BS214	5×26.57×3.53 ARP/BS215	5×28.17×3.53 ARP/BS216

### BOX F X-ring box

<b>Box F: X-rings</b>			<b>NBR80 30 sizes = 377 pieces FPM70 30 sizes = 374 pieces</b>		
20×2.9×1.78 XR-006	20×3.68×1.78 XR-007	20×4.47×1.78 XR-008	20×(19×) 5.28×1.78 XR-009	20×(19×) 6.07×1.78 XR-010	19×7.66×1.78 XR-011
13×15.54×2.62 XR-114	13×13.94×2.62 XR-113	13×12.37×2.62 XR-112	13×10.77×2.62 XR-111	13×9.19×2.62 XR-110	20×(19×)9.25×1.78 XR-012
13×17.12×2.62 XR-115	13×18.72×2.62 XR-116	10×18.64×3.53 XR-210	10×20.22×3.53 XR-211	10×21.82×3.53 XR-212	10×23.39×3.53 XR-213
10×39.92×3.53 XR-219	10×31.34×3.53 XR-218	10×29.74×3.53 XR-217	10×28.17×3.53 XR-216	10×26.57×3.53 XR-215	10×24.99×3.53 XR-214
10×34.52×3.53 XR-220	10×36.09×3.53 XR-221	9×37.69×3.53 XR-222	6×37.47×5.33 XR-325	6×40.64×5.33 XR-326	6×43.82×5.33 XR-327

# O-ring

## Bonded O-ring

O-rings are usually molded, while bonded O-rings are made by bonding or vulcanizing extruded strips. These O-rings are used only for unimportant sealing and static sealing applications. It should be noted that the inside diameter should exceed 100 mm.

Bonded O-rings can be made from standard rubber such as NBR, FPM and MVO. Special rubber can only be supplied in certain quantities.

Bonded O-rings have a greater deviation in inside diameter and cross-sectional diameter than molded O-rings.

## O-ring Cord

O-ring cords are supplied in lengths; and the standard rubber materials are NBR 70 black and FPM 75 black, which are in stock.

The cross-sectional dimensions for NBR 70 and FPM 75 are shown in the table below.

O-ring cords are supplied in rolls of 100 meters.

The deviation of O-ring cords is usually larger than that of O-rings.

### 70 Shore A NBR cords

Diameter W	± deviation	Diameter W	± deviation	Diameter W	± deviation
1.78	0.2	7	0.55	25	1
2	0.2	7.5	0.55	30	1
2.4	0.25	8	0.55		
2.5	0.25	8.5	0.55		
2.62	0.25	9	0.55		
3	0.25	10	0.55		
3.2	0.35	11	0.65		
3.5	0.35	12	0.65		
4	0.35	13	0.65		
4.5	0.4	14	0.65		
5	0.4	15	0.65		
5.5	0.4	16	0.65		
5.7	0.4	18	0.85		
6	0.4	20	0.85		
6.5	0.55	22	0.85		

# O-ring

## 75 Shore A FPM cords

Diameter W	± deviation	Diameter W	± deviation	Diameter W	± deviation
2	0.2	7.5	0.4	30	1.3
2.4	0.2	8	0.4		
2.5	0.2	8.5	0.4		
2.62	0.25	9	0.4		
3	0.25	10	0.4		
3.5	0.3	11	0.5		
4	0.3	12	0.5		
4.5	0.3	13	0.5		
4.75	0.3	14	0.5		
5	0.3	15	0.5		
5.5	0.3	16	0.5		
5.7	0.3	18	1		
6	0.3	20	1		
6.5	0.4	22	1		
7	0.4	25	1		

FOLON-A

# X-ring

## I. Overview

The X-ring is a four-lip seal, which is similar in shape to X, hence the name. It is improved and enhanced based on the O-ring, and its standard size is exactly the same as the standard O-ring in AS 568A. The X-ring can replace the O-ring in most applications.

## II. Advantages

- Smaller friction resistance and start-up resistance compared with the O-ring due to the formation of a lubricated cavity between the sealing lips.
- Good sealing effect since the flash is located in the concave part of the cross-section.
- Non-circular cross-section, avoiding rolling during reciprocating movement.

## III. Technical data (see the figure below)

X-rings have a wide range of applications. Suitable sealing materials can be selected depending on temperature, pressure and medium. In order to adapt the X-ring as a sealing element to the given application, the mutual effect among all operating parameters should be considered.

### ■ Performance parameters

Technical Parameter \ Item		Dynamic Seal		Static Seal
		Reciprocating Movement	Rotating Movement	
Working pressure (MPa)	With a back-up ring	30	15	40
	Without a back-up ring	5	—	5
Speed (m/s)		0.5	0.2	—
Temperature (°C)		General applications: -30°C~110°C Special material: -60°C~200°C Rotating applications: -30°C~+80°C		

When determining the application specifications, the peak temperature, the continuous operating temperature and the operating cycle must be taken into account. In rotating applications, the temperature rise caused by frictional heat must also be considered.

## IV. Working Principle

The X-ring is a double-acting sealing element of self-sealing type. The radial and axial forces depend on the system pressure. As the pressure rises, the compression deformation of the X-ring increases and the overall sealing performance improves, resulting in a reliable seal.

### V. How to choose X-rings

If the diameter of the shaft hole is known, select suitable X-rings based on the following guidelines;

1. Static seal or reciprocating linear movement:

Piston seal: The inside diameter of the X-ring should be compatible with the groove or less than about 2% of the outside diameter of the groove, because the pre-pressing force generated by the pre-compression can effectively prevent the twisting of the X-ring.

Shaft seal: The inside diameter of the X-ring should be equal to or about 0.2~0.3 mm larger than the outside diameter of the shaft, and can also be 1% larger than the outside diameter of the shaft. As a result, the X-ring can be mounted more easily while obtaining a longer service life.

2. Rotary seal: The inside diameter of the X-ring should be about 2%~5% larger than the diameter of the shaft to be sealed. That's because the X-ring used in the rotating movement will be heated due to friction, and the elastomer will shrink when heated (Joule effect). In order to ensure the seal lubrication and reliable operation, the inside diameter of X-ring must be larger than the shaft diameter.

Usually, seals with a smaller cross-section area can meet the needs of static seals, and seals with a larger cross-section area can meet the needs of dynamic seals.

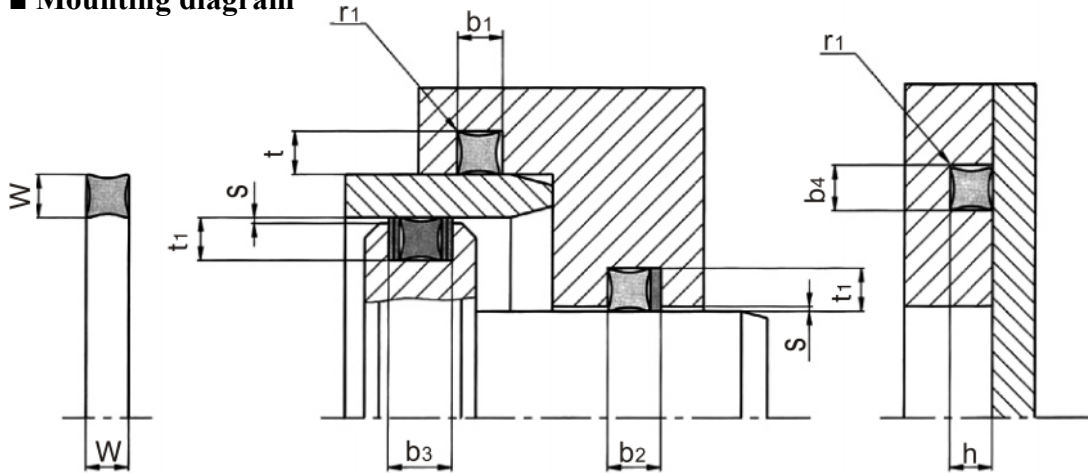
In case of a high pressure or a large extrusion gap, a harder rubber material must be used. The best way is to add a PTFE back-up ring, to prevent extrusion damage due to high pressure.

### VI. Material

The material is 70 Shore A nitrile rubber N70, and for other materials, please refer to the materials used for O-rings.

# X-ring

## ■ Mounting diagram



## ■ Mounting dimensions

Cross-sectional Diameter (W)	Radial Initial Compression		Groove Dimensions					Radius r1	Extrusion gap $S_{max}$
	Dynamic Seal $\frac{max}{min}$	Static Seal $\frac{max}{min}$	Groove Depth		Groove Width				
			Dynamic Seal $t1+0.05$	Static Seal $t/h+0.05$	$b1.b4+0.2$	$b2+0.2$	$b3+0.2$		
1.02	$\frac{0.300}{0.115}$	$\frac{0.350}{0.165}$	0.80	0.75	1.20			0.10	0.03
1.27	$\frac{0.330}{0.145}$	$\frac{0.430}{0.245}$	1.00	0.90	1.40			0.10	0.03
1.52	$\frac{0.350}{0.165}$	$\frac{0.450}{0.265}$	1.25	1.15	1.70			0.22	0.04
1.78	$\frac{0.360}{0.175}$	$\frac{0.460}{0.275}$	1.50	1.40	2.00	3.40	4.80	0.22	0.05
2.62	$\frac{0.400}{0.215}$	$\frac{0.450}{0.265}$	2.30	2.25	3.00	4.40	5.80	0.30	0.08
3.53	$\frac{0.430}{0.205}$	$\frac{0.530}{0.305}$	3.20	3.10	4.00	5.40	6.80	0.40	0.08
5.33	$\frac{0.560}{0.250}$	$\frac{0.710}{0.400}$	4.90	4.75	6.00	7.70	9.40	0.40	0.10
6.99	$\frac{0.700}{0.350}$	$\frac{0.950}{0.600}$	6.40	6.20	8.00	10.50	13.00	0.60	0.10

# X-ring

## ■ Model and size chart

Model	Inside Diameter		Cross-sectional Diameter		Model	Inside Diameter		Cross-sectional Diameter	
	d1	±	W	±		d1	±	W	±
X001	0.74	0.10	1.02	0.08	X023	26.70	0.25	1.78	0.08
X002	1.07	0.10	1.27	0.08	X024	28.30	0.25	1.78	0.08
X003	1.42	0.10	1.52	0.08	X025	29.87	0.28	1.78	0.08
X003A	1.78	0.13	1.02	0.08	X026	31.47	0.28	1.78	0.08
X004	1.78	0.13	1.78	0.08	X027	33.05	0.28	1.78	0.08
X005A	2.00	0.13	1.5	0.08	X028	34.65	0.33	1.78	0.08
X005	2.57	0.13	1.78	0.08	X029	37.82	0.33	1.78	0.08
X006	2.9	0.13	1.78	0.08	X030	41	0.33	1.78	0.08
X007	3.68	0.13	1.78	0.08	X031	44.17	0.38	1.78	0.08
X008	4.47	0.13	1.78	0.08	X032	47.35	0.38	1.78	0.08
X009	5.28	0.13	1.78	0.08	X033	50.52	0.46	1.78	0.08
X010	6.07	0.13	1.78	0.08	X034	53.70	0.46	1.78	0.08
X011	7.65	0.13	1.78	0.08	X035	56.87	0.46	1.78	0.08
X012A	8.20	0.13	1.78	0.08	X036	60.05	0.46	1.78	0.08
X012	9.25	0.13	1.78	0.08	X037	63.22	0.46	1.78	0.08
X013	10.82	0.13	1.78	0.08	X038	66.40	0.51	1.78	0.08
X014	12.42	0.13	1.78	0.08	X039	69.57	0.51	1.78	0.08
X015	14	0.18	1.78	0.08	X040	72.75	0.51	1.78	0.08
X016	15.6	0.23	1.78	0.08	X041	75.92	0.61	1.78	0.08
X017	17.17	0.23	1.78	0.08	X042	82.27	0.61	1.78	0.08
X018	18.77	0.23	1.78	0.08	X043	88.62	0.61	1.78	0.08
X019	20.35	0.23	1.78	0.08	X044	94.97	0.69	1.78	0.08
X020	21.95	0.23	1.78	0.08	X045	101.32	0.69	1.78	0.08
X021	23.52	0.23	1.78	0.08	X046	107.67	0.76	1.78	0.08
X022	25.12	0.23	1.78	0.08	X047	114.02	0.76	1.78	0.08



## X-ring

Model	Inside Diameter		Cross-sectional Diameter		Model	Inside Diameter		Cross-sectional Diameter	
	d1	±	W	±		d1	±	W	±
X048	120.37	0.76	1.78	0.08	X125	32.99	0.30	2.62	0.08
X049	126.72	0.94	1.78	0.08	X126	34.59	0.30	2.62	0.08
X050	133.07	0.94	1.78	0.08	X127	36.17	0.30	2.62	0.08
X102	1.24	0.10	2.62	0.08	X128	37.77	0.30	2.62	0.08
X103	2.06	0.10	2.62	0.08	X129	39.34	0.38	2.62	0.08
X104	2.84	0.13	2.62	0.08	X130	40.94	0.38	2.62	0.08
X105	3.36	0.13	2.62	0.08	X131	42.52	0.38	2.62	0.08
X106	4.42	0.13	2.62	0.08	X132	44.12	0.38	2.62	0.08
X107	5.23	0.13	2.62	0.08	X133	45.69	0.38	2.62	0.08
X108	6.02	0.13	2.62	0.08	X134	47.29	0.38	2.62	0.08
X109	7.59	0.13	2.62	0.08	X135	48.90	0.43	2.62	0.08
X110	9.19	0.13	2.62	0.08	X136	50.47	0.43	2.62	0.08
X111A	10.20	0.13	2.62	0.08	X137	52.07	0.43	2.62	0.08
X111	10.77	0.13	2.62	0.08	X138	53.64	0.43	2.62	0.08
X112	12.37	0.13	2.62	0.08	X139	55.25	0.43	2.62	0.08
X113	13.94	0.18	2.62	0.08	X140	56.82	0.43	2.62	0.08
X114	15.54	0.23	2.62	0.08	X141	58.42	0.51	2.62	0.08
X114A	14.70	0.23	2.62	0.08	X142	59.99	0.51	2.62	0.08
X114B	14.80	0.23	2.62	0.08	X143	61.60	0.51	2.62	0.08
X115A	16.20	0.23	2.62	0.08	X144	63.17	0.51	2.62	0.08
X115	17.12	0.23	2.62	0.08	X145	64.77	0.51	2.62	0.08
X116	18.72	0.23	2.62	0.08	X146	66.34	0.51	2.62	0.08
X117	20.29	0.25	2.62	0.08	X147	67.95	0.56	2.62	0.08
X118	21.89	0.25	2.62	0.08	X148	69.52	0.56	2.62	0.08
X119	23.47	0.25	2.62	0.08	X149	71.12	0.56	2.62	0.08
X120	25.07	0.25	2.62	0.08	X150	72.69	0.56	2.62	0.08
X121	26.64	0.25	2.62	0.08	X151	75.87	0.61	2.62	0.08
X122	28.24	0.25	2.62	0.08	X152	82.22	0.61	2.62	0.08
X123	29.82	0.30	2.62	0.08	X153	88.57	0.61	2.62	0.08
X124	31.42	0.30	2.62	0.08	X154	94.92	0.71	2.62	0.08

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## X-ring

Model	Inside Diameter		Cross-sectional Diameter		Model	Inside Diameter		Cross-sectional Diameter	
	d1	±	W	±		d1	±	W	±
X155	101.27	0.71	2.62	0.08	X207	13.87	0.18	3.53	0.10
X156	107.62	0.76	2.62	0.08	X208	15.47	0.23	3.53	0.10
X157	113.97	0.76	2.62	0.08	X209	17.04	0.23	3.53	0.10
X158	120.32	0.76	2.62	0.08	X210A	18.20	0.25	3.53	0.10
X159	126.67	0.89	2.62	0.08	X210	18.64	0.25	3.53	0.10
X160	133.02	0.89	2.62	0.08	X211	20.22	0.25	3.53	0.10
X161	139.37	0.89	2.62	0.08	X212	21.82	0.25	3.53	0.10
X162	145.72	0.89	2.62	0.08	X213	23.39	0.25	3.53	0.10
X163	152.02	0.89	2.62	0.08	X214	24.99	0.25	3.53	0.10
X164	158.42	1.02	2.62	0.08	X215	26.57	0.25	3.53	0.10
X165	164.77	1.02	2.62	0.08	X216	28.17	0.25	3.53	0.10
X166	171.12	1.02	2.62	0.08	X217	29.74	0.30	3.53	0.10
X167	177.47	1.02	2.62	0.08	X218	31.34	0.30	3.53	0.10
X168	183.82	1.14	2.62	0.08	X219	32.92	0.30	3.53	0.10
X169	190.17	1.14	2.62	0.08	X220	34.52	0.30	3.53	0.10
X170	196.52	1.14	2.62	0.08	X221	36.09	0.30	3.53	0.10
X171	202.87	1.14	2.62	0.08	X222	37.69	0.38	3.53	0.10
X172	209.22	1.27	2.62	0.08	X223	40.87	0.38	3.53	0.10
X173	215.57	1.27	2.62	0.08	X224	44.04	0.38	3.53	0.10
X174	221.92	1.27	2.62	0.08	X225	47.22	0.46	3.53	0.10
X175	228.27	1.27	2.62	0.08	X226	50.39	0.46	3.53	0.10
X176	234.62	1.40	2.62	0.08	X227	53.57	0.46	3.53	0.10
X177	240.97	1.40	2.62	0.08	X228	56.74	0.51	3.53	0.10
X178	247.32	1.40	2.62	0.08	X229	59.92	0.51	3.53	0.10
X201	4.34	0.13	3.53	0.10	X230	63.09	0.51	3.53	0.10
X202	5.94	0.13	3.53	0.10	X231	66.27	0.51	3.53	0.10
X203	7.52	0.13	3.53	0.10	X232	69.44	0.61	3.53	0.10
X204	9.12	0.13	3.53	0.10	X233	72.62	0.61	3.53	0.10
X205	10.69	0.13	3.53	0.10	X234	75.79	0.61	3.53	0.10
X206	12.29	0.13	3.53	0.10	X235	78.97	0.61	3.53	0.10

## X-ring

Model	Inside Diameter		Cross-sectional Diameter		Model	Inside Diameter		Cross-sectional Diameter	
	d1	±	W	±		d1	±	W	±
X236	82.14	0.61	3.53	0.10	X266	202.79	1.14	3.53	0.10
X237	85.32	0.61	3.53	0.10	X267	209.14	1.27	3.53	0.10
X238	88.49	0.61	3.53	0.10	X268	215.49	1.27	3.53	0.10
X239	91.67	0.71	3.53	0.10	X269	221.84	1.27	3.53	0.10
X240	94.84	0.71	3.53	0.10	X270	228.19	1.27	3.53	0.10
X241	98.02	0.71	3.53	0.10	X271	234.54	1.40	3.53	0.10
X242	101.19	0.71	3.53	0.10	X272	240.89	1.40	3.53	0.10
X243	104.37	0.71	3.53	0.10	X273	247.24	1.40	3.53	0.10
X244	107.54	0.76	3.53	0.10	X274	253.59	1.40	3.53	0.10
X245	110.72	0.76	3.53	0.10	X275	266.29	1.40	3.53	0.10
X246	113.89	0.76	3.53	0.10	X276	278.99	1.65	3.53	0.10
X247	117.07	0.76	3.53	0.10	X277	291.69	1.65	3.53	0.10
X248	120.24	0.76	3.53	0.10	X278	304.39	1.65	3.53	0.10
X249	123.42	0.84	3.53	0.10	X279	329.79	1.65	3.53	0.10
X250	126.59	0.84	3.53	0.10	X280	355.19	1.65	3.53	0.10
X251	129.77	0.84	3.53	0.10	X281	380.59	1.65	3.53	0.10
X252	132.94	0.89	3.53	0.10	X282	405.26	1.90	3.53	0.10
X253	136.12	0.89	3.53	0.10	X283	430.66	2.26	3.53	0.10
X254	139.29	0.89	3.53	0.10	X284	456.06	2.42	3.53	0.10
X255	142.47	0.89	3.53	0.10	X309	10.46	0.13	5.33	0.13
X256	145.64	0.89	3.53	0.10	X310	12.07	0.13	5.33	0.13
X257	148.82	0.89	3.53	0.10	X311	13.64	0.18	5.33	0.13
X258	151.99	0.89	3.53	0.10	X312	15.24	0.23	5.33	0.13
X259	158.34	1.02	3.53	0.10	X313	16.81	0.23	5.33	0.13
X260	164.69	1.02	3.53	0.10	X314	18.42	0.25	5.33	0.13
X261	171.04	1.02	3.53	0.10	X315	19.99	0.25	5.33	0.13
X262	177.39	1.02	3.53	0.10	X316	21.59	0.25	5.33	0.13
X263	183.74	1.14	3.53	0.10	X317	23.16	0.25	5.33	0.13
X264	190.09	1.14	3.53	0.10	X318	24.77	0.25	5.33	0.13
X265	196.44	1.14	3.53	0.10	X319	26.34	0.25	5.33	0.13

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## X-ring

Model	Inside Diameter		Cross-sectional Diameter		Model	Inside Diameter		Cross-sectional Diameter	
	d1	±	W	±		d1	±	W	±
X320	27.94	0.30	5.33	0.13	X348	110.49	0.76	5.33	0.13
X321	29.51	0.30	5.33	0.13	X349	113.67	0.76	5.33	0.13
X322	31.12	0.30	5.33	0.13	X350	116.84	0.76	5.33	0.13
X323	32.69	0.30	5.33	0.13	X351	120.02	0.76	5.33	0.13
X324	34.29	0.30	5.33	0.13	X352	123.19	0.76	5.33	0.13
X325	37.47	0.38	5.33	0.13	X353	126.37	0.94	5.33	0.13
X326A	39.20	0.38	5.33	0.13	X354	129.54	0.94	5.33	0.13
X326	40.64	0.38	5.33	0.13	X355	132.72	0.94	5.33	0.13
X327	43.82	0.38	5.33	0.13	X356	135.89	0.94	5.33	0.13
X328A	45.20	0.38	5.33	0.13	X357	139.07	0.94	5.33	0.13
X328	46.99	0.38	5.33	0.13	X358	142.24	0.94	5.33	0.13
X329	50.17	0.46	5.33	0.13	X359	145.42	0.94	5.33	0.13
X330	53.34	0.46	5.33	0.13	X360	148.49	0.94	5.33	0.13
X331	56.52	0.46	5.33	0.13	X361	151.77	0.94	5.33	0.13
X332	59.69	0.46	5.33	0.13	X262	158.12	1.02	5.33	0.13
X333	62.87	0.51	5.33	0.13	X363	164.47	1.02	5.33	0.13
X334	66.04	0.51	5.33	0.13	X364	170.82	1.02	5.33	0.13
X335	69.22	0.51	5.33	0.13	X365	177.17	1.02	5.33	0.13
X336	72.39	0.51	5.33	0.13	X366	183.52	1.14	5.33	0.13
X337	75.57	0.51	5.33	0.13	X367	189.87	1.14	5.33	0.13
X338	78.74	0.61	5.33	0.13	X368	196.22	1.14	5.33	0.13
X339	81.92	0.61	5.33	0.13	X369	202.57	1.14	5.33	0.13
X340	85.09	0.61	5.33	0.13	X370	208.92	1.27	5.33	0.13
X341	88.27	0.61	5.33	0.13	X371	215.57	1.27	5.33	0.13
X342	91.44	0.71	5.33	0.13	X372	221.62	1.27	5.33	0.13
X343	94.62	0.71	5.33	0.13	X373	227.97	1.27	5.33	0.13
X344	97.79	0.71	5.33	0.13	X374	234.32	1.40	5.33	0.13
X345	100.97	0.71	5.33	0.13	X375	240.67	1.40	5.33	0.13
X346	104.14	0.71	5.33	0.13	X376	247.02	1.40	5.33	0.13
X347	107.32	0.76	5.33	0.13	X377	253.37	1.40	5.33	0.13

## X-ring

Model	Inside Diameter		Cross-sectional Diameter		Model	Inside Diameter		Cross-sectional Diameter	
	d1	±	W	±		d1	±	W	±
X378	266.07	1.52	5.33	0.13	X437	151.77	0.94	6.99	0.15
X379	278.77	1.52	5.33	0.13	X438	158.12	1.02	6.99	0.15
X380	291.47	1.65	5.33	0.13	X439A	160.5	1.02	6.99	0.15
X381	304.17	1.65	5.33	0.13	X439	164.47	1.02	6.99	0.15
X382	329.57	1.65	5.33	0.13	X440	170.82	1.02	6.99	0.15
X383	354.97	1.78	5.33	0.13	X441	177.17	1.02	6.99	0.15
X384	380.37	1.78	5.33	0.13	X442	183.52	1.14	6.99	0.15
X385	405.26	1.91	5.33	0.13	X443	189.87	1.14	6.99	0.15
X386	430.66	2.03	5.33	0.13	X444	196.22	1.14	6.99	0.15
X387	456.06	2.15	5.33	0.13	X445	202.57	1.14	6.99	0.15
X388	481.41	2.25	5.33	0.13	X446	215.27	1.4	6.99	0.15
X389	506.81	2.41	5.33	0.13	X447	227.97	1.4	6.99	0.15
X390	532.21	2.41	5.33	0.13	X448	240.67	1.4	6.99	0.15
X391	557.61	2.54	5.33	0.13	X449	253.37	1.4	6.99	0.15
X392	582.68	2.67	5.33	0.13	X450	266.07	1.52	6.99	0.15
X393	608.08	2.79	5.33	0.13	X451	278.77	1.52	6.99	0.15
X394	633.48	2.92	5.33	0.13	X452	291.47	1.52	6.99	0.15
X395	658.88	3.05	5.33	0.13	X453	304.17	1.52	6.99	0.15
X425	113.67	0.84	6.99	0.15	X454	316.87	1.52	6.99	0.15
X426	116.84	0.84	6.99	0.15	X455	329.57	1.52	6.99	0.15
X427	120.02	0.84	6.99	0.15	X456	342.27	1.79	6.99	0.15
X428	123.19	0.84	6.99	0.15	X457	354.97	1.79	6.99	0.15
X429	126.37	0.94	6.99	0.15	X458	367.67	1.79	6.99	0.15
X430	129.54	0.94	6.99	0.15	X459	380.37	1.79	6.99	0.15
X431	132.72	0.94	6.99	0.15	X460	393.07	1.79	6.99	0.15
X432	135.89	0.94	6.99	0.15	X461	405.26	1.9	6.99	0.15
X433	139.07	0.94	6.99	0.15	X462	417.96	1.9	6.99	0.15
X434	142.24	0.94	6.99	0.15	X463	430.66	2.05	6.99	0.15
X435	145.42	0.94	6.99	0.15	X464	443.36	2.15	6.99	0.15
X436	148.59	0.94	6.99	0.15	X465	456.06	2.15	6.99	0.15

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## X-ring

Model	Inside Diameter		Cross-sectional Diameter		Model	Inside Diameter		Cross-sectional Diameter	
	d1	±	W	±		d1	±	W	±
X466	468.76	2.15	6.99	0.15					
X467	481.46	2.29	6.99	0.15					
X468	494.16	2.29	6.99	0.15					
X469	506.86	2.41	6.99	0.15					
X470	532.26	2.41	6.99	0.15					
X471	557.66	2.55	6.99	0.15					
X472	582.68	2.65	6.99	0.15					
X473	608.08	2.8	6.99	0.15					
X474	633.48	2.9	6.99	0.15					
X475	658.87	3.05	6.99	0.15					

## Back-up Ring

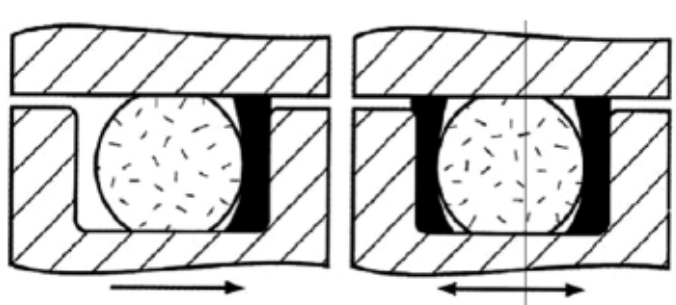
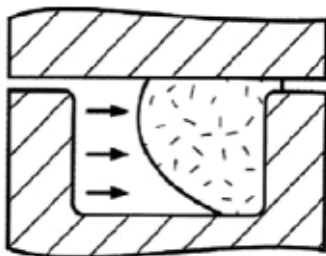
### Mounting O-ring + back-up ring

1) The company has the NBR back-up rings with a hardness of 90 ShA (Shore A) in stock. See the next page for sizes. The main function of these back-up rings is to prevent the seal from extrusion into the gap on the low-pressure side under pressure when the gap is large, which may cause seal damage and eventual seal failure when the pressure increases.

The use of back-up rings can prevent the seal from extrusion into the radial gap on the low-pressure side and maintains the sealing effect. Also, it prevents the O-ring from wearing out too quickly.

The diagram shows the O-ring under pressure.

It is easy to mount the back-up ring. It is installed in the opposite direction of the O-ring under pressure to bear the pressure. For double-acting piston rods, the back-up ring can be mounted on the both sides of the O-ring.



### Advantages of this mounting method

Effective protection of the O-ring, thus increasing its service life.

Cost reduction: This system allows the use of seals that allow larger gaps to reduce machining costs.

### Applications:

Temperature: -30°C to 120°C

Exposure to liquids: Refer to the chemical resistance table.

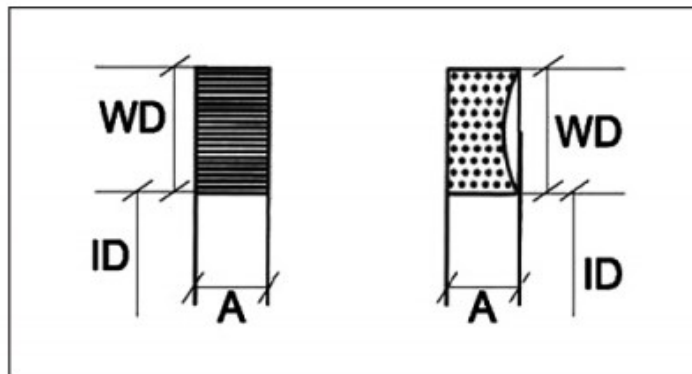
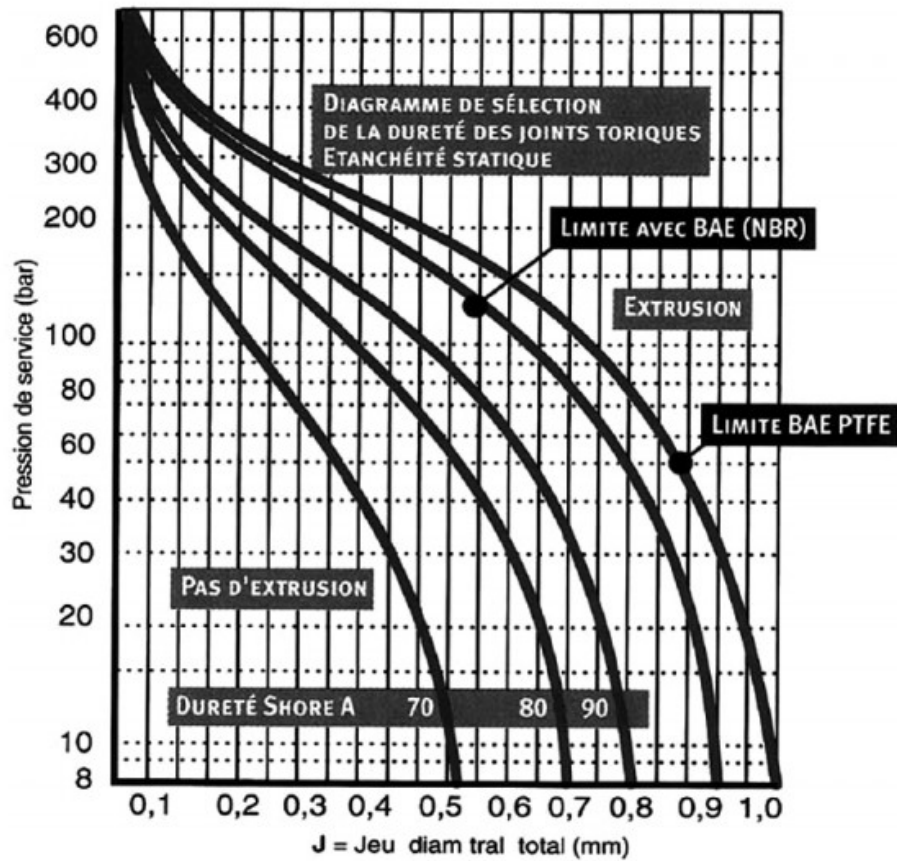
Pressure resistance: See chart on the next page (in the chart: horizontal coordinate: total diameter gap (mm);

Vertical coordinate: Operating pressure (bar); curve labeling (from top to bottom);

Limits for NBR back-up rings; limits for PTFE back-up rings.

O-ring hardness will also affect its use.

## Back-up Ring



### 2) PTFE back-up ring

The PTFE back-up ring has the same function as the NBR back-up ring, but it has a wider range of applications than the latter.

Temperature: -150°C to 250°C

Exposure to liquids: Refer to the chemical resistance table.

All back-up rings are machined directly in our factory, and we can quickly supply them in the following section structure, in any size.



## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance $\pm$	WD	Tolerance $\pm$	A	Tolerance $\pm$
9-004	2.44	0.13	1.35	0.08	1.24	0.08
9-005	3.23	0.13	1.35	0.08	1.24	0.08
9-006	3.56	0.13	1.35	0.08	1.24	0.08
9-007	4.34	0.13	1.35	0.08	1.24	0.08
9-008	5.13	0.13	1.35	0.08	1.24	0.08
9-009	5.94	0.13	1.35	0.08	1.24	0.08
9-010	6.73	0.13	1.35	0.08	1.24	0.08
9-011	8.31	0.13	1.35	0.08	1.24	0.08
9-012	9.91	0.13	1.35	0.08	1.24	0.08
9-013	11.56	0.13	1.35	0.08	1.24	0.08
9-014	13.16	0.13	1.35	0.08	1.24	0.08
9-015	14.73	0.18	1.35	0.08	1.24	0.08
9-016	16.33	0.23	1.35	0.08	1.24	0.08
9-017	17.91	0.23	1.35	0.08	1.24	0.08
9-018	19.51	0.23	1.35	0.08	1.24	0.08
9-019	21.08	0.23	1.35	0.08	1.24	0.08
9-020	22.68	0.23	1.35	0.08	1.24	0.08
9-021	24.26	0.23	1.35	0.08	1.24	0.08
9-022	25.86	0.25	1.35	0.08	1.24	0.08
9-023	27.43	0.25	1.35	0.08	1.24	0.08
9-024	29.03	0.25	1.35	0.08	1.24	0.08
9-025	30.61	0.28	1.35	0.08	1.24	0.08
9-026	32.21	0.28	1.35	0.08	1.24	0.08
9-027	33.78	0.28	1.35	0.08	1.24	0.08
9-028	35.38	0.33	1.35	0.08	1.24	0.08
9-029	38.56	0.33	1.35	0.08	1.24	0.08
9-030	41.73	0.33	1.35	0.08	1.24	0.08
9-031	44.91	0.38	1.35	0.08	1.24	0.08
9-032	48.08	0.38	1.35	0.08	1.24	0.08
9-033	51.29	0.46	1.35	0.08	1.24	0.08

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance $\pm$	WD	Tolerance $\pm$	A	Tolerance $\pm$
9-034	54.43	0.46	1.35	0.08	1.24	0.08
9-035	57.61	0.46	1.35	0.08	1.24	0.08
9-036	60.78	0.46	1.35	0.08	1.24	0.08
9-037	63.96	0.46	1.35	0.08	1.24	0.08
9-038	67.13	0.51	1.35	0.08	1.24	0.08
9-039	70.31	0.51	1.35	0.08	1.24	0.08
9-040	73.48	0.51	1.35	0.08	1.24	0.08
9-041	76.66	0.61	1.35	0.08	1.24	0.08
9-042	83.01	0.61	1.35	0.08	1.24	0.08
9-043	89.36	0.61	1.35	0.08	1.24	0.08
9-044	95.71	0.69	1.35	0.08	1.24	0.08
9-045	102.06	0.69	1.35	0.08	1.24	0.08
9-046	108.41	0.76	1.35	0.08	1.24	0.08
9-047	114.76	0.76	1.35	0.08	1.24	0.08
9-048	121.11	0.76	1.35	0.08	1.24	0.08
9-049	127.46	0.94	1.35	0.08	1.24	0.08
9-050	133.84	0.94	1.35	0.08	1.24	0.08
9-102	1.96	0.13	2.18	0.08	1.35	0.08
9-103	2.77	0.13	2.18	0.08	1.35	0.08
9-104	3.56	0.13	2.18	0.08	1.35	0.08
9-105	4.34	0.13	2.18	0.08	1.35	0.08
9-106	5.13	0.13	2.18	0.08	1.35	0.08
9-107	5.94	0.13	2.18	0.08	1.35	0.08
9-108	6.73	0.13	2.18	0.08	1.35	0.08
9-109	8.31	0.13	2.18	0.08	1.35	0.08
9-110	9.91	0.13	2.18	0.08	1.35	0.08
9-111	11.48	0.13	2.18	0.08	1.35	0.08
9-112	13.08	0.13	2.18	0.08	1.35	0.08
9-113	14.66	0.18	2.18	0.08	1.35	0.08
9-114	16.26	0.23	2.18	0.08	1.35	0.08

FOLON-A

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance $\pm$	WD	Tolerance $\pm$	A	Tolerance $\pm$
9-115	17.83	0.23	2.18	0.08	1.35	0.08
9-116	19.43	0.23	2.18	0.08	1.35	0.08
9-117	21.11	0.25	2.18	0.08	1.35	0.08
9-118	22.68	0.25	2.18	0.08	1.35	0.08
9-119	24.28	0.25	2.18	0.08	1.35	0.08
9-120	25.86	0.25	2.18	0.08	1.35	0.08
9-121	27.46	0.25	2.18	0.08	1.35	0.08
9-122	29.03	0.25	2.18	0.08	1.35	0.08
9-123	30.63	0.30	2.18	0.08	1.35	0.08
9-124	32.21	0.30	2.18	0.08	1.35	0.08
9-125	33.81	0.30	2.18	0.08	1.35	0.08
9-126	35.58	0.30	2.18	0.08	1.35	0.08
9-127	36.98	0.30	2.18	0.08	1.35	0.08
9-128	38.56	0.30	2.18	0.08	1.35	0.08
9-129	40.16	0.38	2.18	0.08	1.35	0.08
9-130	41.73	0.38	2.18	0.08	1.35	0.08
9-131	43.33	0.38	2.18	0.08	1.35	0.08
9-132	44.91	0.38	2.18	0.08	1.35	0.08
9-133	46.51	0.38	2.18	0.08	1.35	0.08
9-134	48.08	0.38	2.18	0.08	1.35	0.08
9-135	49.68	0.43	2.18	0.08	1.35	0.08
9-136	51.26	0.43	2.18	0.08	1.35	0.08
9-137	52.86	0.43	2.18	0.08	1.35	0.08
9-138	54.43	0.43	2.18	0.08	1.35	0.08
9-139	56.03	0.43	2.18	0.08	1.35	0.08
9-140	57.61	0.43	2.18	0.08	1.35	0.08
9-141	59.21	0.51	2.18	0.08	1.35	0.08
9-142	60.78	0.51	2.18	0.08	1.35	0.08
9-143	62.38	0.51	2.18	0.08	1.35	0.08
9-144	63.96	0.51	2.18	0.08	1.35	0.08

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-145	65.56	0.51	2.18	0.08	1.35	0.08
9-146	67.13	0.51	2.18	0.08	1.35	0.08
9-147	68.73	0.56	2.18	0.08	1.35	0.08
9-148	70.31	0.56	2.18	0.08	1.35	0.08
9-149	71.91	0.56	2.18	0.08	1.35	0.08
9-150	73.48	0.56	2.18	0.08	1.35	0.08
9-151	76.66	0.61	2.18	0.08	1.35	0.08
9-152	83.01	0.61	2.18	0.08	1.35	0.08
9-153	89.36	0.61	2.18	0.08	1.35	0.08
9-154	95.71	0.71	2.18	0.08	1.35	0.08
9-155	102.06	0.71	2.18	0.08	1.35	0.08
9-156	108.41	0.76	2.18	0.08	1.35	0.08
9-157	114.76	0.76	2.18	0.08	1.35	0.08
9-158	121.11	0.76	2.18	0.08	1.35	0.08
9-159	127.46	0.89	2.18	0.08	1.35	0.08
9-160	133.81	0.89	2.18	0.08	1.35	0.08
9-161	140.16	0.89	2.18	0.08	1.35	0.08
9-162	146.51	0.89	2.18	0.08	1.35	0.08
9-163	152.86	0.89	2.18	0.08	1.35	0.08
9-164	159.21	1.02	2.18	0.08	1.35	0.08
9-165	165.56	1.02	2.18	0.08	1.35	0.08
9-166	171.91	1.02	2.18	0.08	1.35	0.08
9-167	178.26	1.02	2.18	0.08	1.35	0.08
9-168	184.61	1.14	2.18	0.08	1.35	0.08
9-169	190.96	1.14	2.18	0.08	1.35	0.08
9-170	197.31	1.14	2.18	0.08	1.35	0.08
9-171	203.66	1.14	2.18	0.08	1.35	0.08
9-172	210.01	1.27	2.18	0.08	1.35	0.08
9-173	216.36	1.27	2.18	0.08	1.35	0.08
9-174	222.71	1.27	2.18	0.08	1.35	0.08

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-175	229.06	1.27	2.18	0.08	1.35	0.08
9-176	235.41	1.4	2.18	0.08	1.35	0.08
9-177	241.76	1.4	2.18	0.08	1.35	0.08
9-178	248.11	1.4	2.18	0.08	1.35	0.08
9-201	5.13	0.13	3.00	0.10	1.27	0.08
9-202	6.73	0.13	3.00	0.1	1.27	0.08
9-203	8.30	0.13	3.00	0.1	1.27	0.08
9-204	9.90	0.13	3.00	0.1	1.27	0.08
9-205	11.56	0.13	3.00	0.1	1.27	0.08
9-206	13.16	0.13	3.00	0.1	1.27	0.08
9-207	14.73	0.18	3.00	0.1	1.27	0.08
9-208	16.33	0.23	3.00	0.1	1.27	0.08
9-209	17.91	0.23	3.00	0.1	1.27	0.08
9-210	19.46	0.25	3.00	0.1	1.27	0.08
9-211	21.03	0.25	3.00	0.1	1.27	0.08
9-212	22.63	0.25	3.00	0.1	1.27	0.08
9-213	24.21	0.25	3.00	0.1	1.27	0.08
9-214	25.81	0.25	3.00	0.1	1.27	0.08
9-215	27.38	0.25	3.00	0.1	1.27	0.08
9-216	28.98	0.3	3.00	0.1	1.27	0.08
9-217	30.56	0.3	3.00	0.1	1.27	0.08
9-218	32.16	0.3	3.00	0.1	1.27	0.08
9-219	33.88	0.3	3.00	0.1	1.27	0.08
9-220	35.48	0.3	3.00	0.1	1.27	0.08
9-221	37.06	0.3	3.00	0.1	1.27	0.08
9-222	38.66	0.38	3.00	0.1	1.27	0.08
9-223	41.83	0.38	3.00	0.1	1.27	0.08
9-224	45.01	0.38	3.00	0.1	1.27	0.08
9-225	48.18	0.46	3.00	0.1	1.27	0.08
9-226	51.36	0.46	3.00	0.1	1.27	0.08

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-227	54.53	0.46	3.00	0.10	1.27	0.08
9-228	57.71	0.51	3.00	0.10	1.27	0.08
9-229	60.88	0.51	3.00	0.10	1.27	0.08
9-230	64.06	0.51	3.00	0.10	1.27	0.08
9-231	66.83	0.51	3.00	0.10	1.27	0.08
9-232	70.00	0.61	3.00	0.10	1.27	0.08
9-233	73.18	0.61	3.00	0.10	1.27	0.08
9-234	76.35	0.61	3.00	0.10	1.27	0.08
9-235	79.53	0.61	3.00	0.10	1.27	0.08
9-236	82.70	0.61	3.00	0.10	1.27	0.08
9-237	85.88	0.61	3.00	0.10	1.27	0.08
9-238	89.05	0.61	3.00	0.10	1.27	0.08
9-239	92.23	0.71	3.00	0.10	1.27	0.08
9-240	95.40	0.71	3.00	0.10	1.27	0.08
9-241	98.58	0.71	3.00	0.10	1.27	0.08
9-242	101.75	0.71	3.00	0.10	1.27	0.08
9-243	104.93	0.71	3.00	0.10	1.27	0.08
9-244	108.10	0.76	3.00	0.10	1.27	0.08
9-245	111.28	0.76	3.00	0.10	1.27	0.08
9-246	114.45	0.76	3.00	0.10	1.27	0.08
9-247	117.63	0.76	3.00	0.10	1.27	0.08
9-248	121.11	0.76	3.00	0.10	1.27	0.08
9-249	124.28	0.89	3.00	0.10	1.27	0.08
9-250	127.46	0.89	3.00	0.10	1.27	0.08
9-251	130.63	0.89	3.00	0.10	1.27	0.08
9-252	133.81	0.89	3.00	0.10	1.27	0.08
9-253	136.98	0.89	3.00	0.10	1.27	0.08
9-254	140.16	0.89	3.00	0.10	1.27	0.08
9-255	143.33	0.89	3.00	0.10	1.27	0.08
9-256	146.51	0.89	3.00	0.10	1.27	0.08

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-257	149.68	0.89	3.00	0.10	1.27	0.08
9-258	152.86	0.89	3.00	0.10	1.27	0.08
9-259	159.21	1.02	3.00	0.10	1.27	0.08
9-260	165.56	1.02	3.00	0.10	1.27	0.08
9-261	171.91	1.02	3.00	0.10	1.27	0.08
9-262	178.26	1.02	3.00	0.10	1.27	0.08
9-263	184.61	1.14	3.00	0.10	1.27	0.08
9-264	190.96	1.14	3.00	0.10	1.27	0.08
9-265	197.31	1.14	3.00	0.10	1.27	0.08
9-266	203.66	1.14	3.00	0.10	1.27	0.08
9-267	210.01	1.27	3.00	0.10	1.27	0.08
9-268	216.36	1.27	3.00	0.10	1.27	0.08
9-269	222.71	1.27	3.00	0.10	1.27	0.08
9-270	229.06	1.27	3.00	0.10	1.27	0.08
9-271	235.41	1.40	3.00	0.10	1.27	0.08
9-272	241.76	1.40	3.00	0.10	1.27	0.08
9-273	248.11	1.40	3.00	0.10	1.27	0.08
9-274	254.46	1.40	3.00	0.10	1.27	0.08
9-275	267.16	1.40	3.00	0.10	1.27	0.08
9-276	279.86	1.65	3.00	0.10	1.27	0.08
9-277	292.65	1.65	3.00	0.10	1.27	0.08
9-278	305.26	1.65	3.00	0.10	1.27	0.08
9-279	330.66	1.65	3.00	0.10	1.27	0.08
9-280	356.06	1.65	3.00	0.10	1.27	0.08
9-281	381.46	1.65	3.00	0.10	1.27	0.08
9-282	406.12	1.91	3.00	0.10	1.27	0.08
9-283	431.52	2.03	3.00	0.10	1.27	0.08
9-284	456.92	2.16	3.00	0.10	1.27	0.08
9-309	11.43	0.13	4.65	0.13	1.93	0.10
9-310	13.03	0.13	4.65	0.13	1.93	0.10

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-311	14.60	0.18	4.65	0.13	1.93	0.10
9-312	16.20	0.23	4.65	0.13	1.93	0.10
9-313	17.78	0.23	4.65	0.13	1.93	0.10
9-314	19.38	0.25	4.65	0.13	1.93	0.10
9-315	20.96	0.25	4.65	0.13	1.93	0.10
9-316	22.56	0.25	4.65	0.13	1.93	0.10
9-317	24.13	0.25	4.65	0.13	1.93	0.10
9-318	25.73	0.25	4.65	0.13	1.93	0.10
9-319	27.31	0.25	4.65	0.13	1.93	0.10
9-320	28.91	0.30	4.65	0.13	1.93	0.10
9-321	30.42	0.30	4.65	0.13	1.93	0.10
9-322	32.08	0.30	4.65	0.13	1.93	0.10
9-323	33.43	0.30	4.65	0.13	1.93	0.10
9-324	35.26	0.30	4.65	0.13	1.93	0.10
9-325	38.43	0.30	4.65	0.13	1.93	0.10
9-326	41.61	0.38	4.65	0.13	1.93	0.10
9-327	44.78	0.38	4.65	0.13	1.93	0.10
9-328	47.96	0.38	4.65	0.13	1.93	0.10
9-329	51.13	0.46	4.65	0.13	1.93	0.10
9-330	54.31	0.46	4.65	0.13	1.93	0.10
9-331	57.61	0.46	4.65	0.13	1.93	0.10
9-332	60.78	0.46	4.65	0.13	1.93	0.10
9-333	63.96	0.51	4.65	0.13	1.93	0.10
9-334	67.13	0.51	4.65	0.13	1.93	0.10
9-335	70.31	0.51	4.65	0.13	1.93	0.10
9-336	73.48	0.51	4.65	0.13	1.93	0.10
9-337	76.66	0.61	4.65	0.13	1.93	0.10
9-338	79.83	0.61	4.65	0.13	1.93	0.10
9-339	83.13	0.61	4.65	0.13	1.93	0.10
9-340	86.31	0.61	4.65	0.13	1.93	0.10



## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-341	89.48	0.71	4.65	0.13	1.93	0.10
9-342	92.66	0.71	4.65	0.13	1.93	0.10
9-343	95.83	0.71	4.65	0.13	1.93	0.10
9-344	99.01	0.71	4.65	0.13	1.93	0.10
9-345	102.31	0.71	4.65	0.13	1.93	0.10
9-346	105.49	0.71	4.65	0.13	1.93	0.10
9-347	108.66	0.76	4.65	0.13	1.93	0.10
9-348	111.84	0.76	4.65	0.13	1.93	0.10
9-349	115.01	0.76	4.65	0.13	1.93	0.10
9-350	118.19	0.76	4.65	0.13	1.93	0.10
9-351	121.36	0.76	4.65	0.13	1.93	0.10
9-352	124.54	0.76	4.65	0.13	1.93	0.10
9-353	127.71	0.94	4.65	0.13	1.93	0.10
9-354	130.89	0.94	4.65	0.13	1.93	0.10
9-355	134.09	0.94	4.65	0.13	1.93	0.10
9-356	137.24	0.94	4.65	0.13	1.93	0.10
9-357	140.41	0.94	4.65	0.13	1.93	0.10
9-358	143.59	0.94	4.65	0.13	1.93	0.10
9-359	146.76	0.94	4.65	0.13	1.93	0.10
9-360	149.94	0.94	4.65	0.13	1.93	0.10
9-361	153.11	0.94	4.65	0.13	1.93	0.10
9-362	159.46	1.02	4.65	0.13	1.93	0.10
9-363	165.81	1.02	4.65	0.13	1.93	0.10
9-364	172.16	1.02	4.65	0.13	1.93	0.10
9-365	178.51	1.02	4.65	0.13	1.93	0.10
9-366	184.86	1.14	4.65	0.13	1.93	0.10
9-367	191.21	1.14	4.65	0.13	1.93	0.10
9-368	197.56	1.14	4.65	0.13	1.93	0.10
9-369	203.91	1.14	4.65	0.13	1.93	0.10
9-370	210.26	1.27	4.65	0.13	1.93	0.10

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-371	216.61	1.27	4.65	0.13	1.93	0.10
9-372	222.96	1.27	4.65	0.13	1.93	0.10
9-373	229.31	1.27	4.65	0.13	1.93	0.10
9-374	235.66	1.27	4.65	0.13	1.93	0.10
9-375	242.01	1.40	4.65	0.13	1.93	0.10
9-376	248.36	1.40	4.65	0.13	1.93	0.10
9-377	254.71	1.40	4.65	0.13	1.93	0.10
9-378	267.41	1.52	4.65	0.13	1.93	0.10
9-379	280.11	1.52	4.65	0.13	1.93	0.10
9-380	292.81	1.65	4.65	0.13	1.93	0.10
9-381	305.51	1.65	4.65	0.13	1.93	0.10
9-382	330.91	1.65	4.65	0.13	1.93	0.10
9-383	356.31	1.78	4.65	0.13	1.93	0.10
9-384	381.71	1.78	4.65	0.13	1.93	0.10
9-385	406.60	1.91	4.65	0.13	1.93	0.10
9-386	432.00	2.03	4.65	0.13	1.93	0.10
9-387	457.40	2.16	4.65	0.13	1.93	0.10
9-388	482.75	2.29	4.65	0.13	1.93	0.10
9-389	508.15	2.41	4.65	0.13	1.93	0.10
9-390	533.55	2.41	4.65	0.13	1.93	0.10
9-391	558.95	2.54	4.65	0.13	1.93	0.10
9-392	584.02	2.67	4.65	0.13	1.93	0.10
9-393	609.42	2.79	4.65	0.13	1.93	0.10
9-394	634.82	2.92	4.65	0.13	1.93	0.10
9-395	660.22	3.05	4.65	0.13	1.93	0.10
9-425	115.60	0.84	5.99	0.15	2.97	0.13
9-426	118.77	0.84	5.99	0.15	2.97	0.13
9-427	121.95	0.84	5.99	0.15	2.97	0.13
9-428	125.20	0.84	5.99	0.15	2.97	0.13
9-429	128.30	0.94	5.99	0.15	2.97	0.13

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-430	131.47	0.94	5.99	0.15	2.97	0.13
9-431	134.65	0.94	5.99	0.15	2.97	0.13
9-432	137.82	0.94	5.99	0.15	2.97	0.13
9-433	141.00	0.94	5.99	0.15	2.97	0.13
9-434	144.17	0.94	5.99	0.15	2.97	0.13
9-435	147.35	0.94	5.99	0.15	2.97	0.13
9-436	150.52	0.94	5.99	0.15	2.97	0.13
9-437	153.70	0.94	5.99	0.15	2.97	0.13
9-438	159.36	1.02	5.99	0.15	2.97	0.13
9-439	165.71	1.02	5.99	0.15	2.97	0.13
9-440	172.06	1.02	5.99	0.15	2.97	0.13
9-441	178.41	1.02	5.99	0.15	2.97	0.13
9-442	184.76	1.14	5.99	0.15	2.97	0.13
9-443	191.11	1.14	5.99	0.15	2.97	0.13
9-444	197.46	1.14	5.99	0.15	2.97	0.13
9-445	203.81	1.14	5.99	0.15	2.97	0.13
9-446	216.51	1.40	5.99	0.15	2.97	0.13
9-447	229.21	1.40	5.99	0.15	2.97	0.13
9-448	241.91	1.40	5.99	0.15	2.97	0.13
9-449	254.61	1.40	5.99	0.15	2.97	0.13
9-450	267.31	1.52	5.99	0.15	2.97	0.13
9-451	280.01	1.52	5.99	0.15	2.97	0.13
9-452	292.71	1.52	5.99	0.15	2.97	0.13
9-453	305.41	1.52	5.99	0.15	2.97	0.13
9-454	318.11	1.52	5.99	0.15	2.97	0.13
9-455	330.81	1.52	5.99	0.15	2.97	0.13
9-456	343.51	1.52	5.99	0.15	2.97	0.13
9-457	356.21	1.78	5.99	0.15	2.97	0.13
9-458	368.91	1.78	5.99	0.15	2.97	0.13
9-459	381.61	1.78	5.99	0.15	2.97	0.13

## Back-up Ring

### Specification list of Back UP Ring series back-up rings

Model	Inside Diameter		WD		A	
	ID	Tolerance ±	WD	Tolerance ±	A	Tolerance ±
9-460	394.31	1.78	5.99	0.15	2.97	0.13
9-461	406.50	1.91	5.99	0.15	2.97	0.13
9-462	419.20	1.91	5.99	0.15	2.97	0.13
9-463	431.90	2.03	5.99	0.15	2.97	0.13
9-464	444.60	2.16	5.99	0.15	2.97	0.13
9-465	457.30	2.16	5.99	0.15	2.97	0.13
9-466	470.00	2.16	5.99	0.15	2.97	0.13
9-467	482.70	2.29	5.99	0.15	2.97	0.13
9-468	495.40	2.29	5.99	0.15	2.97	0.13
9-469	508.10	2.41	5.99	0.15	2.97	0.13
9-470	533.50	2.41	5.99	0.15	2.97	0.13
9-471	558.90	2.54	5.99	0.15	2.97	0.13
9-472	584.30	2.67	5.99	0.15	2.97	0.13
9-473	609.70	2.79	5.99	0.15	2.97	0.13
9-474	635.10	2.92	5.99	0.15	2.97	0.13
9-475	660.5	3.05	5.99	0.15	2.97	0.13

The above sizes are commonly used specifications, and other specifications are available for order.

## Back-up Ring

### Specification list of RAREFLON series back-up rings

Model	Inside Diameter		Outside Diameter		Thickness	
	ID	Tolerance +	D	Tolerance -	A	Tolerance ±
P-3	3	0.15	6	0.15	1.25	0.1
P-4	4	0.15	7	0.15	1.25	0.1
P-5	5	0.15	8	0.15	1.25	0.1
P-6	6	0.15	9	0.15	1.25	0.1
P-7	7	0.15	10	0.15	1.25	0.1
P-8	8	0.15	11	0.15	1.25	0.1
P-9	9	0.15	12	0.15	1.25	0.1
P-10	10	0.15	13	0.15	1.25	0.1
P-10A	10	0.15	14	0.15	1.25	0.1
P-11	11	0.15	15	0.15	1.25	0.1
P-11.2	11.2	0.15	15.2	0.15	1.25	0.1
P-12	12	0.15	16	0.15	1.25	0.1
P-12.5	12.5	0.15	16.5	0.15	1.25	0.1
P-14	14	0.15	18	0.15	1.25	0.1
P-15	15	0.15	19	0.15	1.25	0.1
P-16	16	0.15	20	0.15	1.25	0.1
P-18	18	0.15	22	0.15	1.25	0.1
P-20	20	0.15	24	0.15	1.25	0.1
P-21	21	0.15	25	0.15	1.25	0.1
P-22	22	0.15	26	0.15	1.25	0.1
P-22A	22	0.2	28	0.2	1.25	0.1
P-22.4	22.4	0.2	28.4	0.2	1.25	0.1
P-24	24	0.2	30	0.2	1.25	0.1
P-25	25	0.2	31	0.2	1.25	0.1
P-25.5	25.5	0.2	31.5	0.2	1.25	0.1
P-26	26	0.2	32	0.2	1.25	0.1
P-28	28	0.2	34	0.2	1.25	0.1
P-29	29	0.2	35	0.2	1.25	0.1
P-29.5	29.5	0.2	35.5	0.2	1.25	0.1
P-30	30	0.2	36	0.2	1.25	0.1

## Back-up Ring

### Specification list of RAREFLON series back-up rings

Model	Inside Diameter		Outside Diameter		Thickness	
	ID	Tolerance +	D	Tolerance -	A	Tolerance ±
P-31	31	0.2	37	0.2	1.25	0.1
P-31.5	31.5	0.2	37.5	0.2	1.25	0.1
P-32	32	0.2	38	0.2	1.25	0.1
P-34	34	0.2	40	0.2	1.25	0.1
P-35	35	0.2	41	0.2	1.25	0.1
P-35.5	35.5	0.2	41.5	0.2	1.25	0.1
P-36	36	0.2	42	0.2	1.25	0.1
P-38	38	0.2	44	0.2	1.25	0.1
P-39	39	0.2	45	0.2	1.25	0.1
P-40	40	0.2	46	0.2	1.25	0.1
P-41	41	0.2	47	0.2	1.25	0.1
P-42	42	0.2	48	0.2	1.25	0.1
P-44	44	0.2	50	0.2	1.25	0.1
P-45	45	0.2	51	0.2	1.25	0.1
P-46	46	0.2	52	0.2	1.25	0.1
P-48	48	0.2	54	0.2	1.25	0.1
P-49	49	0.2	55	0.2	1.25	0.1
P-50	50	0.2	56	0.2	1.25	0.1
P-48A	48	0.25	58	0.25	1.9	0.13
P-50A	50	0.25	60	0.25	1.9	0.13
P-52	52	0.25	62	0.25	1.9	0.13
P-53	53	0.25	63	0.25	1.9	0.13
P-55	55	0.25	65	0.25	1.9	0.13
P-56	56	0.25	66	0.25	1.9	0.13
P-58	58	0.25	68	0.25	1.9	0.13
P-60	60	0.25	70	0.25	1.9	0.13
P-62	62	0.25	72	0.25	1.9	0.13
P-63	63	0.25	73	0.25	1.9	0.13
P-65	65	0.25	75	0.25	1.9	0.13
P-67	67	0.25	77	0.25	1.9	0.13

FOLON-A

## Back-up Ring

### Specification list of RAREFLON series back-up rings

Model	Inside Diameter		Outside Diameter		Thickness	
	ID	Tolerance +	D	Tolerance -	A	Tolerance ±
P-70	70	0.25	80	0.25	1.9	0.13
P-71	71	0.25	81	0.25	1.9	0.13
P-75	75	0.25	85	0.25	1.9	0.13
P-80	80	0.25	90	0.25	1.9	0.13
P-85	85	0.25	95	0.25	1.9	0.13
P-90	90	0.25	100	0.25	1.9	0.13
P-95	95	0.25	105	0.25	1.9	0.13
P-100	100	0.25	110	0.25	1.9	0.13
P-102	102	0.25	112	0.25	1.9	0.13
P-105	105	0.25	115	0.25	1.9	0.13
P-110	110	0.25	120	0.25	1.9	0.13
P-112	112	0.25	122	0.25	1.9	0.13
P-115	115	0.25	125	0.25	1.9	0.13
P-120	120	0.25	130	0.25	1.9	0.13
P-125	125	0.25	135	0.25	1.9	0.13
P-130	130	0.25	140	0.25	1.9	0.13
P-132	132	0.25	142	0.25	1.9	0.13
P-135	135	0.25	145	0.25	1.9	0.13
P-140	140	0.25	150	0.25	1.9	0.13
P-145	145	0.25	155	0.25	1.9	0.13
P-150	150	0.3	165	0.3	2.75	0.15
P-155	155	0.3	170	0.3	2.75	0.15
P-160	160	0.3	175	0.3	2.75	0.15
P-165	165	0.3	180	0.3	2.75	0.15
P-170	170	0.3	185	0.3	2.75	0.15
P-175	175	0.3	190	0.3	2.75	0.15
P-180	180	0.3	195	0.3	2.75	0.15
P-185	185	0.3	200	0.3	2.75	0.15
P-190	190	0.3	205	0.3	2.75	0.15

## Back-up Ring

### Specification list of RAREFLON series back-up rings

Model	Inside Diameter		Outside Diameter		Thickness	
	ID	Tolerance +	D	Tolerance -	A	Tolerance ±
P-195	195	0.3	210	0.3	2.75	0.15
P-200	200	0.3	215	0.3	2.75	0.15
P-205	205	0.3	220	0.3	2.75	0.15
P-209	209	0.3	224	0.3	2.75	0.15
P-210	210	0.3	225	0.3	2.75	0.15
P-215	215	0.3	230	0.3	2.75	0.15
P-220	220	0.3	235	0.3	2.75	0.15
P-225	225	0.3	240	0.3	2.75	0.15
P-230	230	0.3	245	0.3	2.75	0.15
P-235	235	0.3	250	0.3	2.75	0.15
P-240	240	0.3	255	0.3	2.75	0.15
P-245	245	0.3	260	0.3	2.75	0.15
P-250	250	0.3	265	0.3	2.75	0.15
P-255	255	0.3	270	0.3	2.75	0.15
P-260	260	0.3	275	0.3	2.75	0.15
P-265	265	0.3	280	0.3	2.75	0.15
P-270	270	0.3	285	0.3	2.75	0.15
P-275	275	0.3	290	0.3	2.75	0.15
P-280	280	0.3	295	0.3	2.75	0.15
P-285	285	0.3	300	0.3	2.75	0.15
P-290	290	0.3	305	0.3	2.75	0.15
P-295	295	0.3	310	0.3	2.75	0.15
P-300	300	0.3	315	0.3	2.75	0.15
P-315	315	0.3	330	0.3	2.75	0.15
P-320	320	0.3	335	0.3	2.75	0.15
P-335	335	0.3	350	0.3	2.75	0.15
P-340	340	0.3	355	0.3	2.75	0.15
P-355	355	0.3	370	0.3	2.75	0.15
P-360	360	0.3	375	0.3	2.75	0.15
P-375	375	0.3	390	0.3	2.75	0.15

FOLON-A



## Back-up Ring

### Specification list of RAREFLON series back-up rings

Model	Inside Diameter		Outside Diameter		Thickness	
	ID	Tolerance +	D	Tolerance -	A	Tolerance ±
P-385	385	0.3	400	0.3	275	0.15
P-400	400	0.3	415	0.3	2.75	0.15
G-25	25	0.2	30	0.2	1.25	0.1
G-30	30	0.2	35	0.2	1.25	0.1
G-35	35	0.2	40	0.2	1.25	0.1
G-40	40	0.2	45	0.2	1.25	0.1
G-45	45	0.2	50	0.2	1.25	0.1
G-50	50	0.2	55	0.2	1.25	0.1
G-55	55	0.25	60	0.25	1.25	0.1
G-60	60	0.25	65	0.25	1.25	0.1
G-65	65	0.25	70	0.25	1.25	0.1
G-70	70	0.25	75	0.25	1.25	0.1
G-75	75	0.25	80	0.25	1.25	0.1
G-80	80	0.25	85	0.25	1.25	0.1
G-85	85	0.25	90	0.25	1.25	0.1
G-90	90	0.25	95	0.25	1.25	0.1
G-95	95	0.25	100	0.25	1.25	0.1
G-100	100	0.25	105	0.25	1.25	0.1
G-105	105	0.25	110	0.25	1.25	0.1
G-110	110	0.25	115	0.25	1.25	0.1
G-115	115	0.25	120	0.25	1.25	0.1
G-120	120	0.25	125	0.25	1.25	0.1
G-125	125	0.25	130	0.25	1.25	0.1
G-130	130	0.25	135	0.25	1.25	0.1
G-135	135	0.25	140	0.25	1.25	0.1
G-140	140	0.25	145	0.25	1.25	0.1
G-145	145	0.25	150	0.25	1.25	0.1

## Back-up Ring

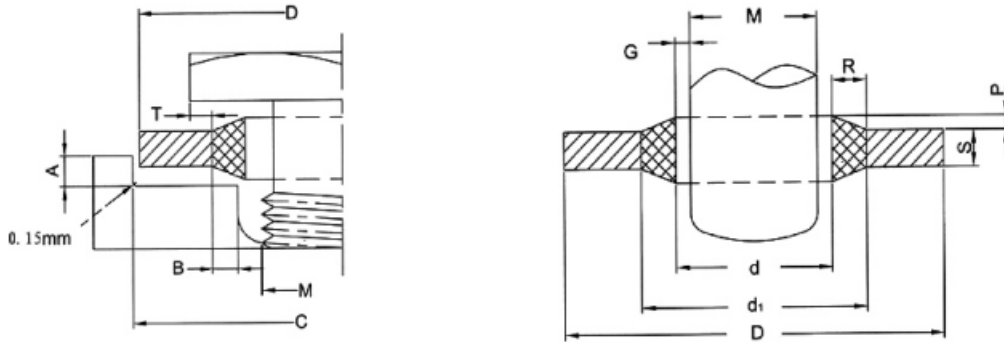
### Specification list of RAREFLON series back-up ring

Model	Inside Diameter		Outside Diameter		Thickness	
	ID	Tolerance +	D	Tolerance -	A	Tolerance ±
G-150	150	0.3	160	0.3	1.9	0.13
G-155	155	0.3	165	0.3	1.9	0.13
G-160	160	0.3	170	0.3	1.9	0.13
G-165	165	0.3	175	0.3	1.9	0.13
G-170	170	0.3	180	0.3	1.9	0.13
G-175	175	0.3	185	0.3	1.9	0.13
G-180	180	0.3	190	0.3	1.9	0.13
G-185	185	0.3	195	0.3	1.9	0.13
G-190	190	0.3	200	0.3	1.9	0.13
G-195	195	0.3	205	0.3	1.9	0.13
G-200	200	0.3	210	0.3	1.9	0.13
G-210	210	0.3	220	0.3	1.9	0.13
G-220	220	0.3	230	0.3	1.9	0.13
G-230	230	0.3	240	0.3	1.9	0.13
G-240	240	0.3	250	0.3	1.9	0.13
G-250	250	0.3	260	0.3	1.9	0.13
G-260	260	0.3	270	0.3	1.9	0.13
G-270	270	0.3	280	0.3	1.9	0.13
G-280	280	0.3	290	0.3	1.9	0.13
G-290	290	0.3	300	0.3	1.9	0.13
G-300	300	0.3	310	0.3	1.9	0.13

FOLON-A

# TBS Combined Sealing Washer

## TBS Combined Sealing Washer



### 1) Material

Material: Stainless steel or steel treated with 70 ShA (+/-) NBR or FKM for corrosion resistance.

### 2) Applications

Applications: Hydraulic cylinders and other hydraulic or pneumatic equipment.

Movement: Static

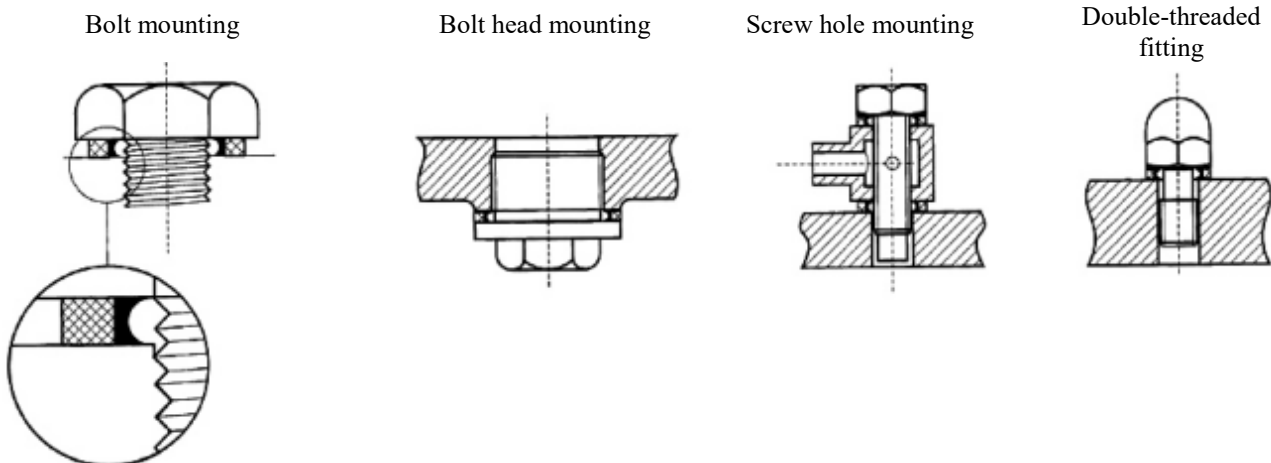
Medium: Mineral oil (DIN51524), and non-easy hydraulic oil (HFA, HFB, HFC)

### 3) Working conditions

Pressure: No more than 600 bar

Temperature: -20°C to 120°C for NBR; -15°C to 240°C for FKM.

### 4) Mounting example (see the figure). For special shapes and sizes, please inquire with us



## TBS Combined Sealing Washer

THREA D DIA. 'M'	SIZE REF ***	D +0.13 -0.00	d ±0.10	d <sub>1</sub> ±0.10	S		R ±0.1	P +0.25 -0.00	RADIA L GAP 'G' ±0.05	MINIMUM BURST PRESSURE BAR	
φ3.5	201	7.2	4.1	5.2	1	±0.1	0.55	0.3	0.3	1600	
5.5	205	9.2	6.2	7.2			0.5		0.35	1220	
6	206	10	6.7	8			0.65		0.35	1120	
6	208	11	6.7	8.2	2.5		0.75		0.35	1480	
6.5	209	12	7.1	8.8	1		0.85		0.3	1560	
6.7	210	10.2	7.3	8.6			0.65		0.3	850	
8	214	16	8.7	10.4			0.85		0.35	2150	
8.5	215	13.3	9.3	10.5			0.6		0.4	1200	
11	219	16.3	11.4	12.7	1.5		0.65		0.4	0.2	1280
11	221	19.1	11.8	13.5			0.85	0.4		1760	
13	224	20	13.7	15.4			0.85	0.35		1340	
13	225	22	13.7	15.4			0.85	0.35		1810	
13	315	20.1	13.8	15.2			0.7	0.4		1430	
13.5	226	18.7	14	15.7			0.85	0.25		900	
15	228	22.7	16	17.78			0.89	0.5		1260	
17.5	231	24.7	18	20.1		1.05	0.25	1070			
21	234	28.7	21.5	23.3		2.5	±0.15	0.9		0.25	1080
22	235	28	22.5	24.2	1.5	±0.1	0.4	0.25	760		
23	325	32	23.7	25.4	2			0.85	0.35	965	
26	327	35.3	27	28.7				0.85	0.5	860	
28	329	36	28.6	30.3				0.85	0.3	720	
28.5	330	37.5	29.2	30.9				0.85	0.35	810	
33	244	43	34.3	36.4				1.05	0.65	870	
39	246	51	40	41.9	2.5			0.95	0.5	1030	
51	249	60	52	54.1	3			±0.15	0.4	0.5	540
52	250	64.5	53.3	56.4						0.65	0.710
60	251	73	60.7	63		1.15	0.35			780	
68	252	79.5	68.6	72.1		3.5	1.75			0.3	510
75	253	90.3	76.08	79.1		3.38	1.51			0.54	700
88	254	101.48	89.09	92.1		3.25	1.5			0.54	510
125	255	143.67	127	132.7	5		1	420			
6	305	13.27	6.85	8	1.3	±0.1	0.3	0.42	1970		
16.5	319	23.9	17.2	18.7	2.1			0.75	0.4	0.35	1020

## TBS Combined Sealing Washer

THREAD DIA. 'M'		SIZE REF		D +0.13 -0.00	d ±0.13	d1 ±0.13	S		R ±0.13	P	RIDIAL GAP G+0.07 INCH B.S.P.	MINIMUM BURST PRESSURE BAR
INCH	B.S.P.	***	+									
6BA		001	1	6.35	3.05		1.22	+0.15 -0.00	0.54	0.25/0.51	0.13	2150
4BA		002	2	7.26	4.12	5.26			0.57		0.26	1570
2BA		003	3	8.38	5.21	6.35			0.57		0.26	1360
1/4		004	4	13.21	6.86	8			0.57		0.26	2430
1/4		005	5	13.34	6.99	9.53			1.27		0.32	1680
5/16		006	6	13.34	8.31	9.53			0.56		0.19	1680
5/16		007	7	14.22	8.64	10.04			0.7		0.35	1750
3/8		008	A	15.88	10.37	11.48	2.03	+0.15 -0.00	0.73	0.42	1480	
40		009	8	18.36	11.26	12.45			0.6	0.55	1950	
7/16		010	9	19.05	11.69	13.08			0.7	0.29	1890	
1/2	1/4	011	B	20.57	13.74	15.21			0.73	0.52 0.29	1540	
9/16		012	10	22.23	14.86	16.39			0.76	0.29	1560	
60		013	BB	22.23	15.83	17.3			0.73	0.3	1290	
5/8		014	11	25.4	16.51	18.75			1.12	0.32	1560	
	3/8	015	C	23.8	17.28	18.75	0.73	0.31	1230			
11/16		016	12	25.4	18.16	19.69	2.34	+0.26 -0.00	0.76	0.35	1310	
3/4		017	CC	26.92	19.69	21.21			0.76	0.32	1230	
13/16	1/2	018	D	28.58	21.54	23.01			0.73	0.45 0.29	1120	
7/8	5/8	019	E	31.75	23.49	24.97			0.74	0.63 0.29	1240	
15/16		020	13	33.27	24.26	26.04			0.89	0.23	1275	
1	3/4	021	F	34.93	27.05	28.53			0.74	0.82 0.30	1050	
1 1/16		022	FF	38.61	27.82	30.61			1.4	0.41	1210	
1 1/8		023	14	36.58	29.33	30.86	0.76	0.38	880			
1 3/16	7/8	024	G	38.1	30.81	32.29	0.74	0.33 0.30	860			
1 1/4		025	15	41.4	32.64	35.69	3.25	1.52	0.45	775		
1 5/16	1	026	H	42.8	33.89	36.88	3.25	1.5	0.28 0.40	780		
1 5/16	1	027	HH	42.8	33.89	36.88	2.34	1.5	0.28 0.40	780		
1 3/8		028	1G	44.45	35.94	38.99	3.25	+0.26 -0.00	1.52	0.51	680	
1 1/2		029	17	47.75	38.96	42.04			1.54	0.43	660	
1 5/8	1 1/4	030	J	52.38	42.93	45.93			1.5	0.82 0.51	690	
1 3/4		031	18	57.15	45.34	48.39			1.52	0.45	870	
1 7/8	1 1/2	032	K	58.6	48.44	51.39			1.47	0.40 0.32	690	
2		033	19	63.5	51.69	54.74			1.52	0.45	780	
2 1/8	1 3/4	034	L	69.85	54.89	58.3			7	0.45 0.57	950	
2 1/4		035	LL	70.36	58.04	61.09	1.52	0.45	740			
	2	036	M	73.03	60.58	63.63	1.52	0.48	720			
2 1/2		037	MM	77.22	64.39	67.44	1.52	0.45	750			
	2 1/4	038	N	79.5	66.68	69.98	1.65	0.59	670			
	2 1/2	039	P	90.3	76.08	79.38	1.65	0.45	680			

## TBS Combined Sealing Washer

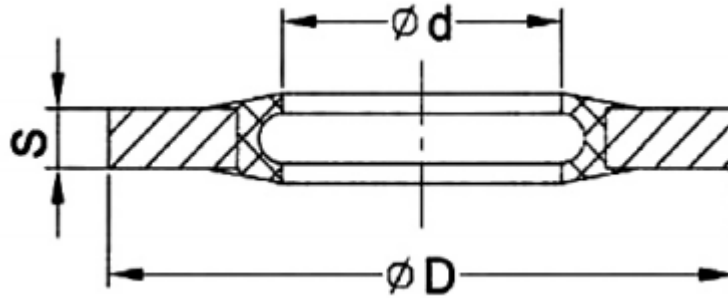
THREA D DIA. 'M'	SIZE REF ***	D +0.13 -0.00	d ±0.10	d <sub>1</sub> ±0.10	S		R ±0.1	P +0.25 -0.00	RADIA L GAP 'G' ±0.05	MINIMUM BURST PRESSURE BAR
3	301	7.5	3.6	5	1	±0.1	0.7		0.3	1980
4	302	9	4.6	6	1		0.7			2000
5	303	10	5.6	7	1		0.7			1780
6	304	11	6.6	8	1		0.7	0.3		1680
6	306	11.4	7	8.4	1		0.7		0.5	1540
8	307	13	8.6	10	1		0.7		0.3	1330
10	310	17	10.7	12.1	1.5		0.7		0.35	1730
11	312	18.1	11.8	13.2	1.5		0.65		0.4	1610
12	313	19	12.7	14.1	1.5		0.7		0.35	1530
14	316	21	14.7	16.1	1.5		0.7			1370
16	317	23	16.7	18.1	1.5		0.7			1240
18	320	27	18.7	20.4	2		0.85			1450
20	321	29	20.7	22.4	2		0.85			1340
22	324	31	22.7	24.4	2		0.85			1240
24	326	33	24.7	26.4	2		0.85			1160
27	328	36	27.7	29.4	2		0.85	0.4		1060
30	331	39	30.7	32.4	2		0.85		970	
33	332	42	33.7	35.4	2		0.85		900	
36	333	48	37	39.6	2.5	±0.15	1.3		0.5	1010
39	334	51	40	42.6	2.5		1.3			950
42	335	54	43	45.6	2.5		1.3			890
45	336	57	46	48.6	2.5		1.3			860
48	337	60	49	51.6	2.5		1.3			790

FOLON-A

## TBS Combined Sealing Washer

THRE AD DIA. 'M'	SIZE REF ***	D +0.13 -0.00	d ±0.10	d <sub>i</sub> ±0.10	S		R ±0.1	P +0.25 -0.00	RADI AL GAP 'G' ±0.05	MINIMUM BURST PRESSURE BAR
4	202	7	4.5	5.4	1		0.45	0.3	0.25	1270
5	203	9	5.7	6.8			0.65		0.35	1400
5	204	10	5.7	7.4			0.85		0.35	1510
6	206	10	6.7	8			0.65		0.35	1120
6	207	11	6.7	8.2			0.75		0.35	1480
8	211	13.4	8.5	9.4			0.45		0.25	1780
8	212	13	8.7	10			0.65		0.35	1330
8	213	14	8.7	10.4			0.85		0.35	1510
10	216	16	10.35	12	2	±0.1	0.82	0.4	0.17	1470
10	217	16	10.7	12.4	0.85		0.35		1300	
10	218	18	10.7	12.4	0.85		0.35		1880	
11	220	18.5	11.8	13.7	0.95		0.4		1540	
12	222	18	12.7	14.4	0.85		0.35		1150	
12	223	20	12.7	14.4	0.85		0.35		1680	
14	227	22	14.7	16.4	0.85		0.35		1510	
16	229	24	16.7	18.4	0.85		0.35		1370	
17	230	24	17.4	19.2	0.9		0.2		1150	
18	232	26	18.7	20.4	0.85		0.35		1260	
20	233	28	20.7	22.5	0.9		0.35		1140	
22	236	30	22.7	24.4	2		0.85		0.35	1080
22	237	30	22.7	24.4	3	±0.15	0.85	0.35	1080	
24	238	32	24.7	26.4	2	±0.1	0.85	0.35	1000	
26	239	35	26.7	28.4			0.85	0.35	1090	
27	240	36	27.2	29			0.9	0.1	1130	
28	241	37	28.7	30.4			0.85	0.35	1030	
30	242	39	31	33			1	0.5	870	
33	243	42	33.7	35.8			1.05	0.35	840	
36	245	46	36.7	38.8	1.05	0.35	890			
42	247	53	42.7	44.4	3	±0.15	0.85	0.35	930	
48	248	59	48.7	50.8			1.05	0.35	790	

## TBS Combined Sealing Washer



### Standardized dimensions

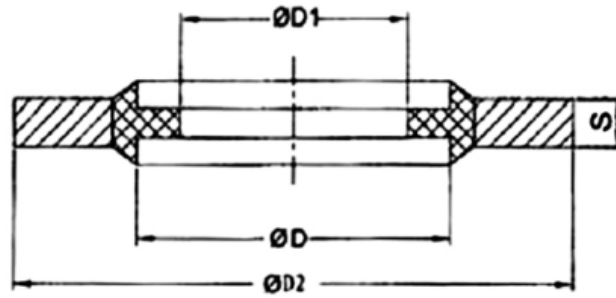
SCREW USED SEAL WASHERS									
PART NO:	PART NO:	d φ	Dφ	S	PART NO:	PART NO:	d φ	Dφ	S
	W2.8	2.6	8.5	1.2		W20	20	32	1.2
	W3	3	10	1.2		W22 S <sub>1</sub>	22	30	1.6
	W4	4	11	1.2		W22	22	35	1.6
	W5	5	12	1.2		W24 S <sub>1</sub>	24	32	1.6
SW6021	W6 S <sub>1</sub>	6	11	1.2		W24	24	39	1.6
	W6	6	13	1.2		W27 S <sub>1</sub>	27	35.5	1.6
SW6016	W8 S <sub>1</sub>	8	13.5	1.2		W28	28	42	1.6
	W8	8	16	1.2		W30 S <sub>1</sub>	30	38	1.6
SW6017	W10 S <sub>1</sub>	10	15.5	1.2		W30	30	48	1.6
	W10	10	18	1.2		W33 S <sub>1</sub>	33	41	1.6
	W12 S <sub>1</sub>	12	19	1.2		W36 S <sub>1</sub>	36	44.5	1.6
	W12	12	22	1.2		W36	36	56	1.6
SW-M020C	W14 S <sub>1</sub>	14	20	1.2		W38	38	60	1.6
	W14	14	23	1.2		W39 S <sub>1</sub>	39	47.5	1.6
	W16 S <sub>1</sub>	16	22.5	1.2		W42 S <sub>1</sub>	42	50.5	1.6
	W16	16	27	1.2		W42	42	65	1.6
	W18 S <sub>1</sub>	18	24.5	1.2		W48	48	73	1.6
	W19	18	28	1.2		W52 S <sub>1</sub>	52	60.5	1.6
	W20 S <sub>1</sub>	20	26.5	1.2					

### SUS 304 material dimensions

PART NO:	d φ	Dφ	S	PART NO:	d φ	Dφ	S
SUS W3	3	10	1.2	SUS W12	12	22	1.2
SUS W4	4	11	1.2	SUS W14	14	23	1.2
SUS W5	5	12	1.2	SUS W16	16	27	1.2
SUS W6	6	13	1.2	SUS W18	18	28	1.2
SUS W8	9	16	1.2	SUS W20	20	32	1.2
SUS W10	10	18	1.2	SUS W24	24	39	1.6



## TBS Combined Sealing Washer

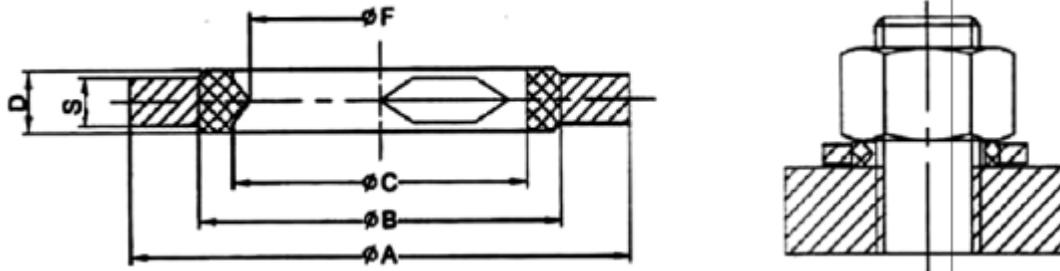


### Standardized dimensions

M thread					
PART NO:	Intended for thread	$\phi D$	$\phi D2$	S	$\phi D1$
CRD-1827	M4	4.5	7	1	3.3
CRD-1828	M5	5.7	10	1	4.45
CRD-1829	M6	6.7	10	1	5.6
CRD-1830	M8	8.7	14	1	6.4
CRD-1831	M10	10.7	16	1.5	8.05
CRD-1832	M12	12.7	19	1.5	9.73
CRD-1833	M13	13.7	20	1.5	10.73
CRD-1834	M14	14.7	22	1.5	11.38
CRD-1835	M16	16.7	24	1.5	13.41
CRD-1836	M18	18.7	26	1.5	14.76
CRD-1837	M20	20.7	28	1.5	16.76
CRD-1838	M22	22.7	30	2	18.74
CRD-1839	M24	24.7	32	2	20.11
CRD-1995	1/8-	10.37	14	1	8.7
CRD-1996	1/4"	13.74	17	1	11.4
CRD-1997	3/8	17.28	22	1.3	15
CRD-1998	1/2"	21.54	26	1.6	18.6
CRD-1999	3/4"	27.05	32	1.6	24
CRD-2000	1"	33.89	39.5	1.8	30.2

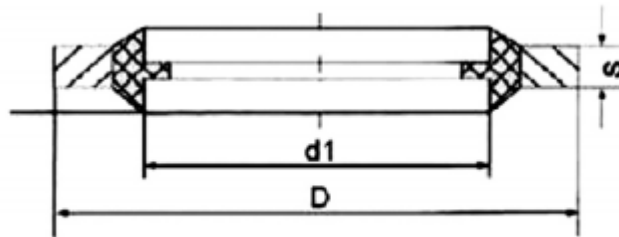
M thread					
PART NO:	Intended for pipe thread	D	D2	S	D1
SW-M004C	G1/8	10.37	15.88	2	8.26
SW-M005C	G1/4	13.74	20.57	2	11.18
SW-M006C	G3/8	17.28	23.8	2	14.76
SW-MQ07C	G1/2	21.54	28.58	2.47	18.24
SW-M008C	G5/8	23.49	31.75	2.47	20.27
SW-M009C	G3/4	27.05	34.93	2.47	23.83
SW-M010C	G1	33.89	42.8	3.4	29.92
SW-M011C	G1 1/4	42.93	52.38	3.4	38.45
SW-M012C	G1 1/2	48.44	58.6	3.4	44.45
SW-M013C	G2	60.58	73.03	3.4	56.26
SW-M015C	G2 1/4	66.68	79.5	3.4	62.36
SW-M016C	G2 1/2	76.08	90.17	3.4	71.5

## TBS Combined Sealing Washer



Metric thread	Art No	A +0.1/-0.1	B +0.1/-0.1	C	D	S	F dia	Clearance hole max dia (ISO/R 2739)	Width of jawa	pitch of thread (P)	Max F Kn (SS 1265-16)
M4	54 1381	7.9	6	4.2 ±0.20	1.8	1.0 +0.05/-0.03	3.1	4.3	7	0.70	6
M5	54 1619	8.9	6.4	5.2	1.8	1	4	5.3	8	0.80	10
M6	54 1382	9.9	8	6.2	1.8		4.7	6.4	10	1.00	15
M8	54 1369	13.9	11	8.2	2.5	1.5+0.06/-0.04	6.4	8.4	14	1.25	33
M10	54 1461	16.9	13	10.2	2.5	1.5	8.1	10.5	17	1.50	54
M12	54 1383	18.9	15	12.2	2.5	1.5	9.8	13	19	1.75	62
M14	54 1620	21.9	18	14.2	3	2.0 +0.07/-0.05	11.5	15	22	2.00	73
M16	54 1586	23.9	20	16.2 ±0.25	3.5	2.5	13.5	17	24	2	80
M18	54 1621	26.9	22	18.2	3.5	2.5	14.8	19	27	2.5	112
M20	54 1622	29.9	25	20.2	3.7	2.5	16.8	21	30	2.5	126
M22	54 1624	31.9	27	22.2	3.7	2.5	18.8	23	32	2.5	135
M24	54 1475	35.9	29	24.2	4.2	3.0 +0.08/-0.06	20.2	25	36	3	210
M30	54 1662	45.9	36	30.2 ±0.36	4.2	3	25.5	31	46	3.5	381
M33		49.9	39.6	33.2	4.2	3	28.5	34	50	3.5	433
M36		54.9	43.6	36.2	4.2	3	31	37	55	4	523
M39		59.9	48	39.2	5.6	4.0 +0.1/-0.08	34	40	60	4	603
M42		64.9	52	42.2 ±0.40	5.6	4	36.3	43	65	4.5	708

※ M8 M10 M12 M16 M18 ARE AVAILABLE



### GB size chart

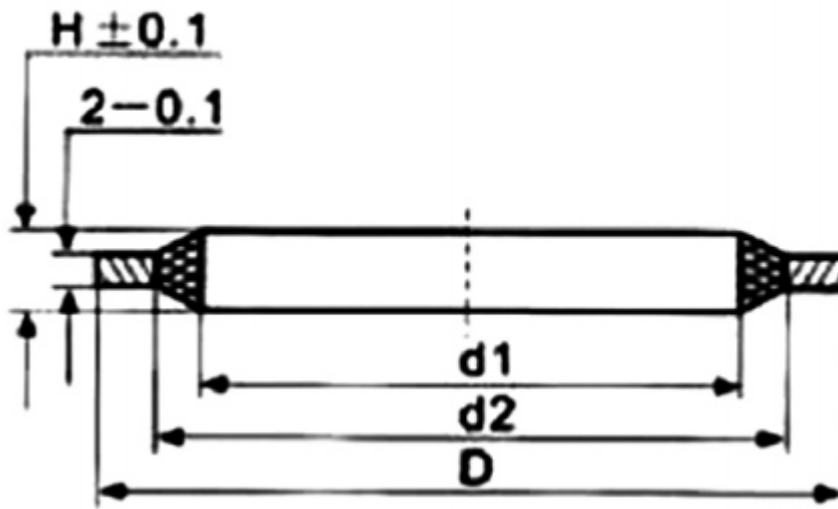
Unit: mm

Nominal Diameter	Dimensions			Applicable Thread		
	d <sub>1</sub> +0.10 -0.10	D +0.30 -0.00	S +0.00 -0.15	Metric System	American National thread	Whitworth thread G
A4.00	4.30	7.20	1.00	M4		
A5.20	5.20	8.40	1,50	M5		
A6.00	6.40	11.70	1.50	M6		
A6.80	6.86	13.20	1.50		1/4"	
A8.00	8.40	13.70	2.00	M8		

## TBS Combined Sealing Washer

Nominal Diameter	Dimensions			Applicable Thread		
	d <sub>1</sub> <sup>+0.10</sup> -0.10	D <sup>+0.30</sup> -0.00	S <sup>+0.00</sup> -0.15	Metric System	American National thread	Whitworth thread G
A8.60	8.64	14.20	2.00		5/16"	
A10.30	10.37	15.80	2.00	M10	3/8"	1/8"
A12.00	12.40	17.70	2.00	M12		
A13.70	13.74	20.60	2.00		1/2"	1/4"
A14.00	14.40	19.70	2.00	M14		
A14.80	14.86	22.20	2.00		9/16"	
A15.80	15.83	22.20	2.00			
A16.00	16.40	21.70	2.00	M16		
A16.50	16.51	25.40	2.00		5/8"	
A17.20	17.30	23.80	2.00			3/8"
A18.00	18.40	24.70	2.50	M18		
A19.60	19.69	26.90	2.50		3/4"	
A20.00	20.50	27.70	2.50	M20		
A21.50	21.54	28.60	2.50		13/16"	1/2"
A22.00	22.50	29.70	2.50	M22		
A23.50	23.49	31.75	2.50		7/8"	5/8"
A24.00	24.50	31.70	2.50	M24		
A24.20	24.26	33.30	2.50		15/16"	
A27.00	27.50	34.70	2.50	M27		
A27.10	27.06	34.90	2.50		1"	3/4"
A30.00	30.50	37.70	2.50	M30		
A30.80	30.81	38.10	2.50		1 3/16"	7/8"
A33.00	33.50	41.70	2.50	M33		
A33.80	33.89	42.80	2.50		1 5/16"	1"
A35.90	35.94	44.50	3.40		1 3/8"	
A36.00	36.60	45.70	2.50	M36		
A39.00	39.60	49.70	2.50	M39		
A42.00	42.60	52.70	2.50	M42		
A42.90	42.93	52.40	2.50		1 5/6"	1 1/4"
A45.00	45.60	55.70	2.50	M45		
A48.00	48.70	59.70	2.50	M48		
A48.50	48.44	58.60	2.50		1 7/8"	1 1/2"
A52.00	52.70	65.70	2.50	M52		
A54.80	54.89	69.85	3.40		2 1/16"	1 3/4"
A60.00	60.70	74.70	2.50	M60		
A60.50	60.58	73.03	2.50	M60		2"

## TBS Combined Sealing Washer

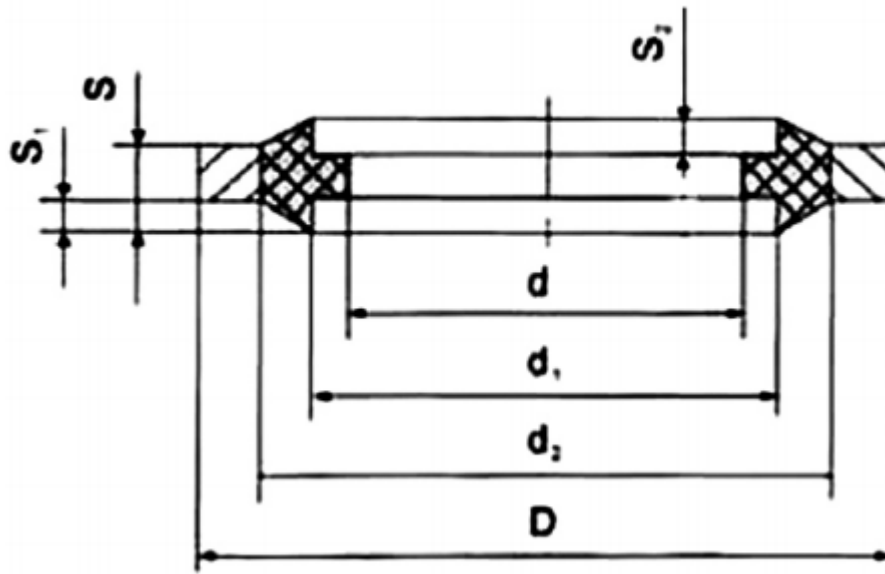


JB982-77 standard

Unit: mm

Nominal Diameter	d	d2	D	H±0.1	Allowable Variation of Hole d2	Applicable Thread Dimensions
*4	4.3	5.3	7.5	2.1	0.1	M4
*6	6.4	8	12			
8	8.4	10	14	2.7		M8
10	10.4	12	16			M10(G1/8")
12	12.4	14	18	0.15		M12
14	14.4	16	20			M14(G1/4")
16	16.4	18	22	2.9		M16
18	18.4	20	25			M18(G3/8")
20	20.5	23	28	0.1		M20
22	22.5	25	30			M22(G1/2")
24	24.5	27	32	0.15		M24
27	27.5	30	35			M27(G3/4")
30	30.5	33	38	2.9	M30	
33	33.5	36	42		M33(G1")	
36	36.6	40	46	0.1	M36	
39	39.6	43	50		M39	
42	42.6	46	53	0.15	M42(G1 1/4")	
45	45.6	49	56		M45	
52	48.7	52	60	0.1	M48(G1 1/2")	
48	52.7	56	66		M52	
60	60.7	64	75	2.9	0.15	M60(G2")

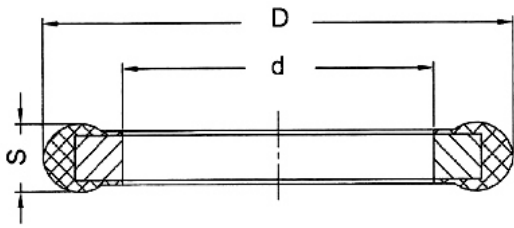
## TBS Combined Sealing Washer



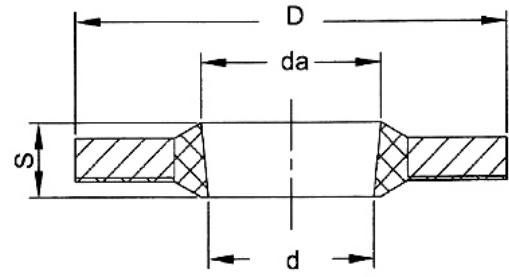
Nominal (Spiral) diam	d	d1	d2	D		S		S1	S2
A,8	7.5	9.3	11	14.8	0	1.5	$\pm 0.11$	0.4	0.8
A,10	8.5	11.8	13.8	17.8	-0.11				
A,12	11.6	13.5	15.5	21	0				
A,14	13.6	16	18	23	-0.13	2	$\pm 0.13$	0.45	1
A,16	15.6	18	20	25	0				
A,18	17.6	20	22	28	-0.16				
A,20	19.6	22	24	32	0				
A,22	21.6	24	26	34	-0.16				
A,24	23.6	26	28	36	0	3	$\pm 0.16$	0.5	1.4
A,27	26.6	29	31	39	0				
A,30	29.6	32	34	42	-0.19				
A,33	32.6	35	37	45	0				
A,39	38.6	41	43	51	-0.19				
A,42	41.6	44	46	54	0	3	$\pm 0.16$	2	2
A,45	44.6	47	49	57	-0.19				
A,48	47.6	50	52	60	0				
A,52	51.6	54	56	66	-0.19				
A,60	59.6	62	65	75	0				

# TBS Combined Sealing Washer

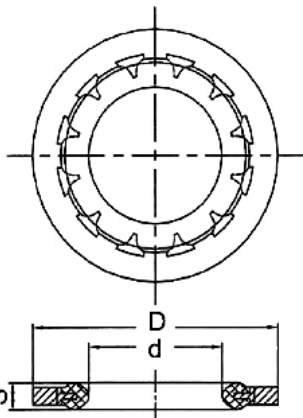
Various types of combined sealing washers:



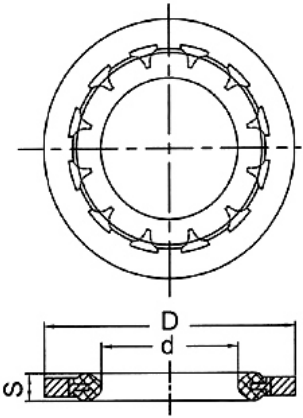
(1)



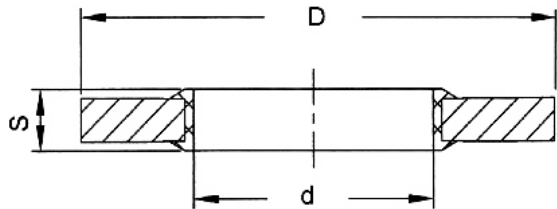
(2)



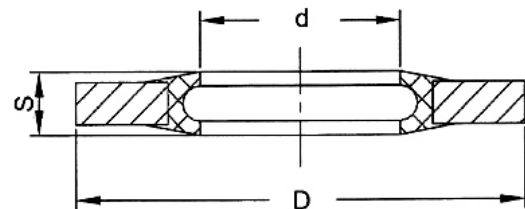
(3)



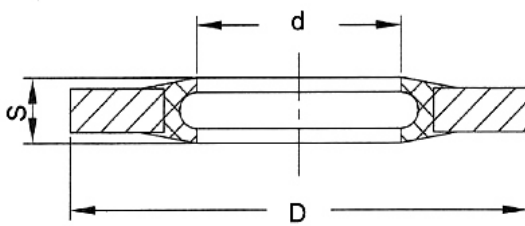
(4)



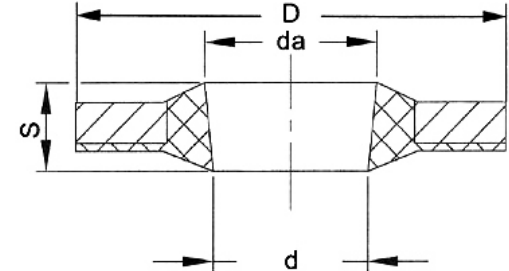
(5)



(6)



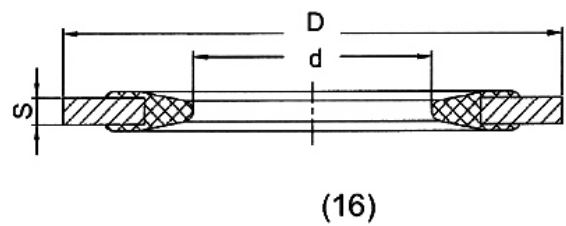
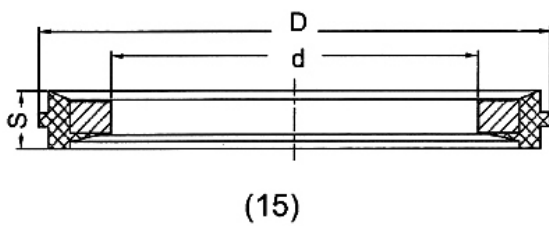
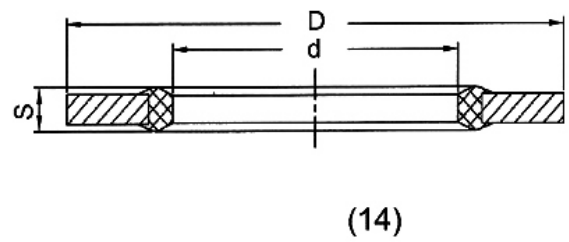
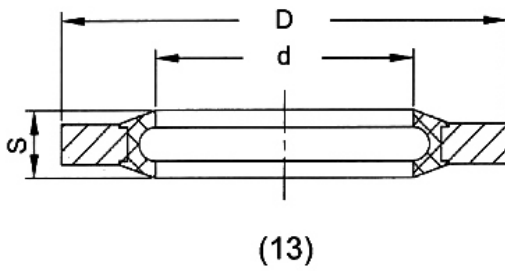
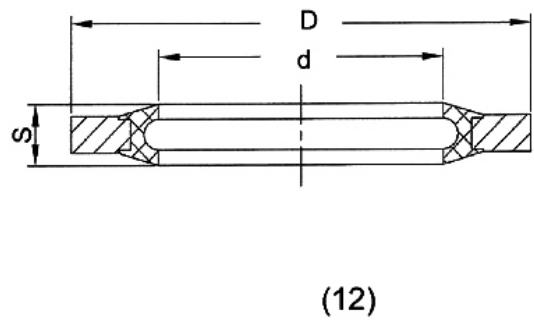
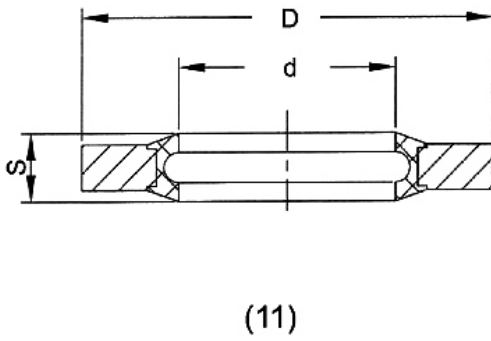
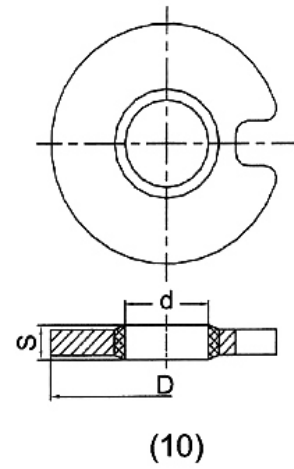
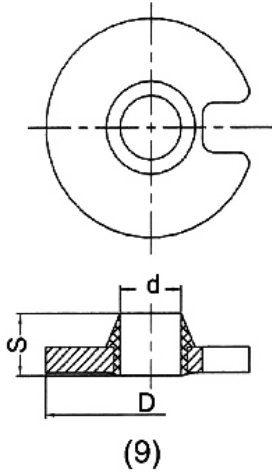
(7)



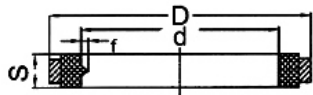
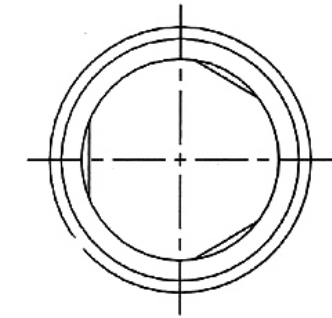
(8)

# TBS Combined Sealing Washer

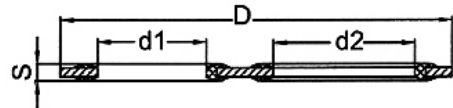
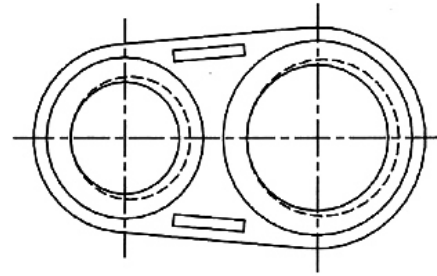
Various types of combined sealing washers:



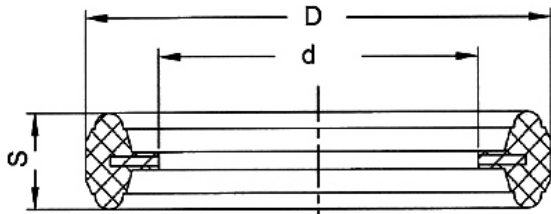
# TBS Combined Sealing Washer



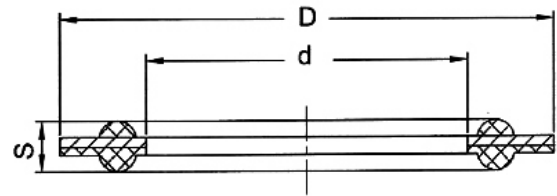
(17)



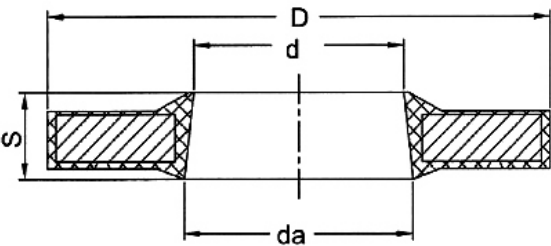
(18)



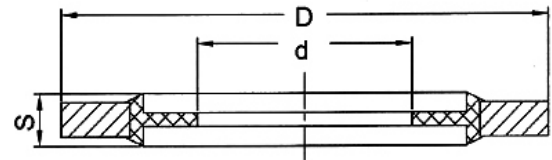
(19)



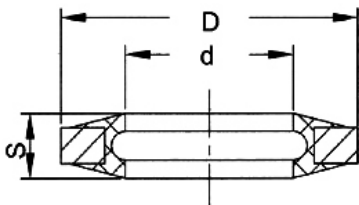
(20)



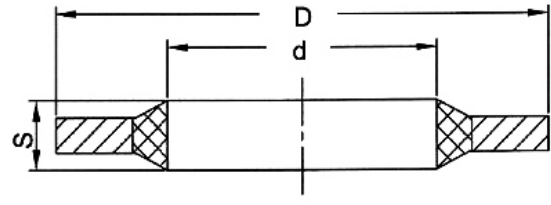
(21)



(22)



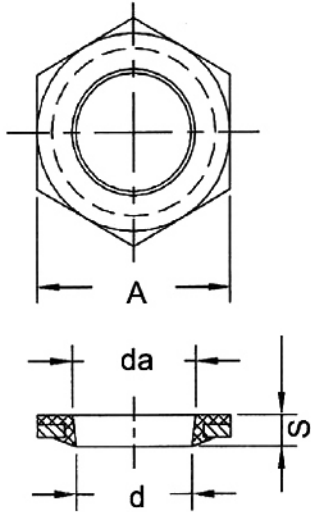
(23)



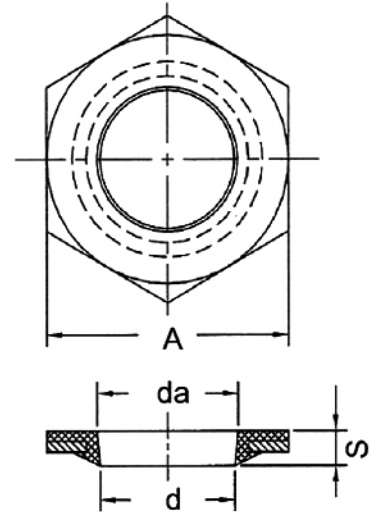
(24)



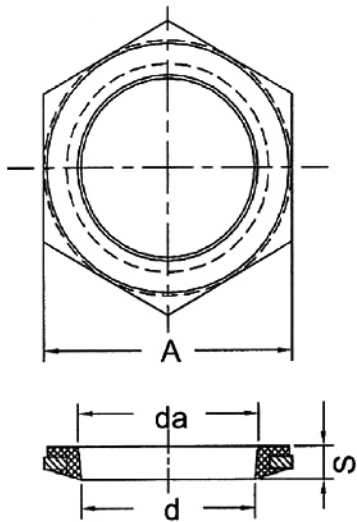
## TBS Combined Sealing Washer



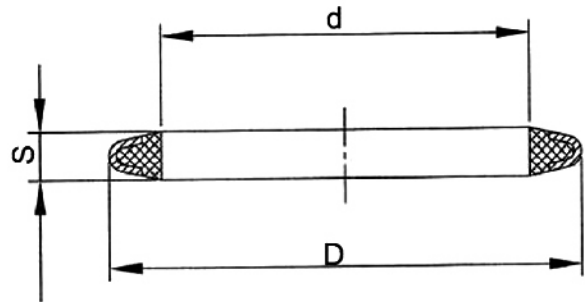
(25)



(26)



(27)



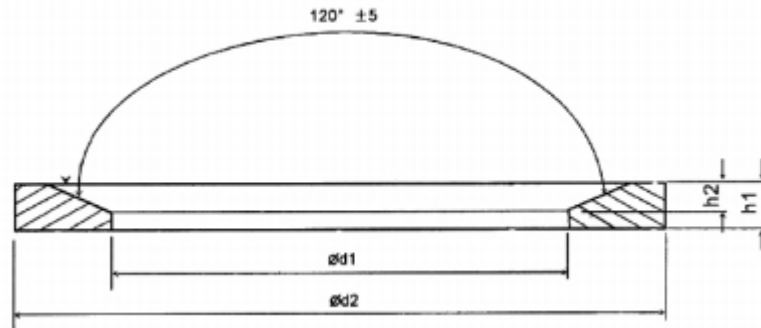
(28)

Note: The specifications and forms not listed can also be arranged for production according to the user's requirements.

## Pipe Fitting Washer

### Bezeichnung eines Profildichtringes nach DIN3869

#### Profile sealing according to DIN 3869



8-10-12-14-16-17-18-20-22-24-27-33-42-48-60

Material:

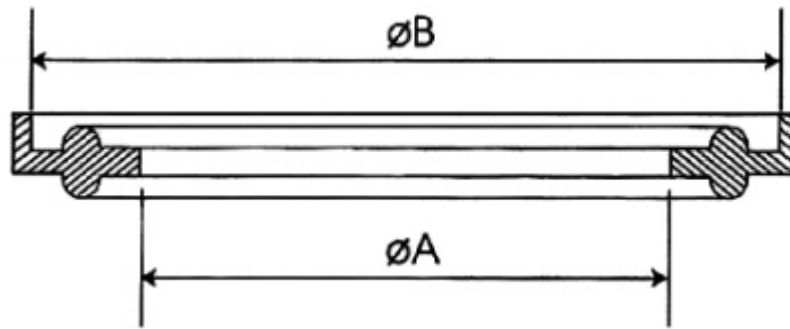
6.00 NBR 85 IRHD black

4.65 FKM 80 IRHD green

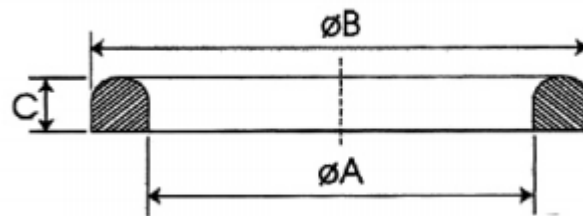
SN	Model		d1	62	h1+0.1	h2
8	M8*1	~	6.50	9.90	1.00	0.50
10	M10*1	1/8	8.40	11.90	1.00	0.50
12	M12*1.5	~	9.80	14.40	1.50	0.80
14	M14*1.5	1/4	11.50	16.50	1.50	0.80
16	M16*1.5	~	13.80	18.90	1.50	0.80
17	~	3/8	14.70	18.90	1.50	0.80
18	M18*1.5	~	15.70	20.90	1.50	0.80
20	M20*1.5	~	17.80	22.90	1.50	0.80
21	~	1/2	18.50	23.90	1.50	0.80
22	M22*1.5	~	19.60	24.30	1.50	0.80
24	M24*1.5	5/8	21.80	26.90	1.50	0.80
27	M26*1.5	3/4	23.90	29.20	1.50	0.80
27	M27*2	3/4	23.90	29.20	1.50	0.80
33	M33*2	1	29.70	35.70	2.00	1.00
42	M42*2	1 1/4	38.80	45.80	2.00	1.00
48	M48*2	1 1/2	44.70	50.70	2.00	1.00
60	M60*2	2	56.50	66.50	4.00	2.00

The above sizes are commonly used specifications, and other specifications are available for order.

## Pipe Fitting Washer

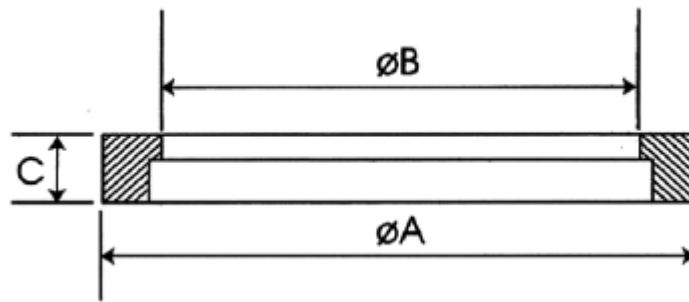


$\varnothing$ TUBE	$\varphi A$ 0/+0.5	$\varphi B$ 0/+0.5	Ref, EPDM FDA	Ref, FKM FDA	Ref, Silicone FDA	Ref, PTFE FDA
25	22.8	50.5	4.580.0025	4.3800025	4.2800025	4.4600025
38	35.8	50.5	4.580.0038	4.3800038	4.2800038	4.4600038
51	48.8	64.0	4.580.0051	4.3800051	4.2800051	4.4600051
63	60.5	77.5	4.580.0063	4.3800063	4.2800063	4.4600063
76	73.1	91.0	4.580.0076	4.3800076	4.2800076	4.4600076
101	97.8	119.0	4.580.1016	4.3801016	4.2801016	4.4601016
104	100.2	119.0	4.580.0104	4.3800104	4.2800104	4.4600104

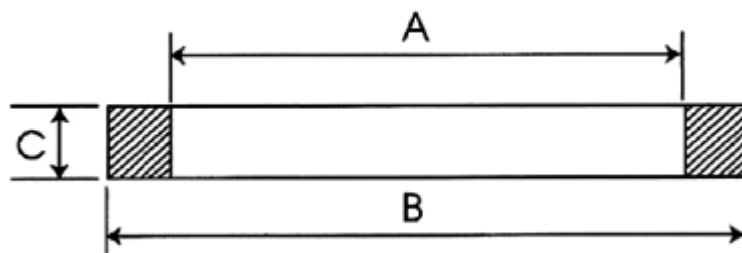


DN	$\varphi A$	$\varphi B$	C	Rel. NBR GRIS	Ref. PTFE FDA
25	30	40	5	4.180.25	4.462.25
32	36	46	5	4.180.32	4.462.32
40	42	52	5	4.180.38	4.462.40
50	54	64	5	4.180.51	4.462.50
65	71	81	5	4.180.63	4.462.65
80	85	95	5	4.180.76	4.462.80
100	104	114	6	4.180.104	4.462.104

## Pipe Fitting Washer



$\varnothing$ TUBE	$\varnothing A$	$\varnothing B$	C	Ref, EPDM FDA	Ref, FKM FDA	Ref, PTFE FDA
25	32.00	22.5	5.5	4.401.9926	4.401.926	4.461.25
38	48.00	35.5	5.5	4.401.9925	4.401.925	4.461.38
51	61.00	48.5	5.5	4.401.9927	4.401.927	4.461.51
63	73.5	60.5	5.5	4.401.9928	4.401.928	4.461.63
76	86.0	72.9	5.5	4.401.9924	4.401.924	4.461.76
104	116	100	5.5	4.401.9929	4.401.929	4.461.104



DN	B	A	C	Ref, NBR FDA	Ref, EPDM FDA	Ref, Silicone FDA	Ref, FKM FDA	Ref, PTFE FDA
25	32	25	5.5	4.501.750	4.501.7510	4.501.7520	4.501.7530	4.463.25
32	40	32	5.5	4.501.9750	4.501.7511	4.501.7521	4.501.7531	4.463.32
40	48	38	5.5	4.501.9751	4.501.7512	4.501.7522	4.501.7532	4.463.40
50	61	51	5.5	4.501.7503	4.501.7512	4.501.7523	4.501.7533	4.463.50
65	73.5	63.5	5.5	4.501.7504	4.501.7514	4.501.7524	4.501.7534	4.463.65
80	86	76	5.5	4.501.7505	4.501.7515	4.501.7525	4.501.7535	4.463.80
100	113.5	101.6	5.5	4.501.7506	4.501.7516	4.501.7526	4.501.7536	4.463.100

# Seals for Drinking Water and Gas

## Certificate

Certified Material				Gas		Drinking Water						Food	
Material	Code	Color Hardness	EN549	EN682	Material	WRAS BS6920	KTW 1.3.13	NSF 61	ACS	EN681-1 WB	OTHERS	FDA	NSF 51
NBR	9000	Black	70	B2H3									
	9001	Black	70				Gold water						
	11713	Black	70	B2H3									
	11723 without plastic	Black	70	B1H3			Hotwater	Hotwater	<63mm			√	
	11788	Black	70	B2H3									
	117035	Black	70				Hotwater						
	24707	Black	70				Hotwater						
	33438	Black	70						√			√	
	33445	Black	70				Hotwater						
	48904	Black	70					Hotwater					
	48910	Black	70								QAS(Australia)		
	117006	Black	70		B1H3								
	117013	Black	70				Gold water						
	117017	Black	70						<63mm				
	117020	Black	70		B2H3	GAL							
	117027 peroxyd	Black	70				Gold water	Hotwater					√
	117035	Black	70					Hotwater					
	117037	Black	70		DIN3535-3			Gold water					
	334012	Black	70		soon								
	24705	Black	70						Hotwater				
	11785	Black	50		B2H2								
	11747	Black	55					Hotwater	Hotwater				√
	11703	Black	60		B2H2								
	11761	Black	60		B2H2								
	48903	Black	60						Hotwater				
	117016	Black	60							<63mm			
	117039	Black	60		B2H2	GAL							
	11705	Black	80		B1H3								
11710	Black	80		B1H3			Gold water		<63mm			√	
11779	Black	80		B2H3									
117040	Black	80			GAL								
48905	Black	80						Hotwater					
VMQ	11717	Red	70				Hotwater					√	
	11766	Red	70	B2H3								√	
	30408	Red	70					Hotwater					
	117021	Red	50			Hotwater						√	
	11712	Red	60				Hotwater	Hotwater				√	
	11765	Red	60		B2H2							√	



FOLON-A

# Seals for Drinking Water and Gas

## Certificate

Certified Material				Gas		Drinking Water						Food	
Material	Code	Color Hardness	EN549	EN682	Material	WRAS BS6920	KTW 1.3.13	NSF 61	ACS	EN681-1 WB	OTHERS	FDA	NSF 51
FMVQ	117034	Blue	60	E2H2									
EPDM	33440	Black	70				Hotwater						
	48900	Black	70					Hotwater					
	117009	Black	70				Coldwater						
	24710	Black	70					Hotwater					
	48902	Black	65					Hotwater					
	48901	Black	80					Hotwater					
	33485	Black					Hotwater						
EPDM Peroxyd	11720	Black	70				Hotwater+W270					√	
	11743 without plastic	Black	70			Hotwater	Hotwater+W270	Hotwater	√	√	TGM(Austria)	√	√
	30406	Black	70					Hotwater					
	48907	Black	70			Hotwater					QAS(Austria)		
	117029	Black	70			Hotwater	Hotwater	Hotwater	<63mm	√		√	√
	51500 without plastic	Black	70			Hotwater	Hotwater		homologuable				
	11774	Black	60				Hotwater		<63mm			√	
	48906	Black	60			Hotwater					QAS(Austria)		
	117031	Black	60			Hotwater	Hotwater			√			
	11714	Black	80				Hotwater		√			√	√
	334039	Black	80				Hotwater						
	48908	Black	80			Hotwater					QAS(Austria)		
FKM	11700	Black	70	E1H3									
	11750	Black	70	E1H3									
	73209	Black	70	E1H3									
	11748	Black	60	E1H2									
	11775	Black	60	E1H2									
	117011	Black	60	E1H2									

Water temperature of En549	A1	B1	C1	D1	E1	A2	B2	C2	D2	E2
from	0	0	0	0	0	-20	-20	-20	-20	-20
to	60	80	100	125	150	60	80	100	125	150

Hardness of En549	H1	H2	H3
from	<45	56a60	>60



## Rubber and Plastic Parts

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**Customizable  
according to  
customers'  
requirements**



## Rubber and Plastic Parts

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**Customizable  
according to  
customers'  
requirements**

