

# TOMBO™ BRAND

## Elastomer O-Rings

General Catalog of High Performance Elastomer O-Rings



**BLAZER™**  
**SERIES**  
High Performance Elastomer Parts

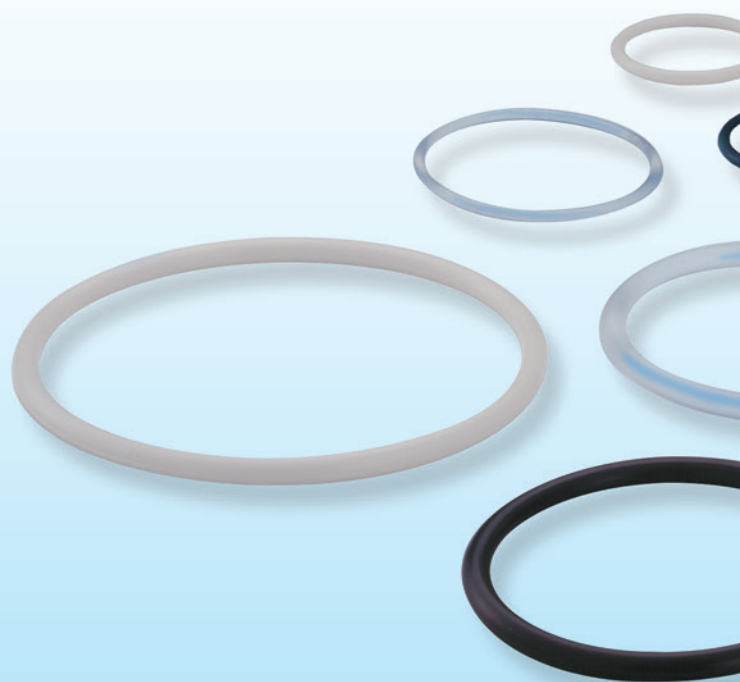
NICHIAS elastomer O-rings meet the stringent requirements for components used in various industrial field, by means of versatile functionality and a complete product lineup.

Our high performance elastomer with properties, such as purity and resistance against heat, chemical, wear, plasma and ozone, are suitable for various conditions of use.

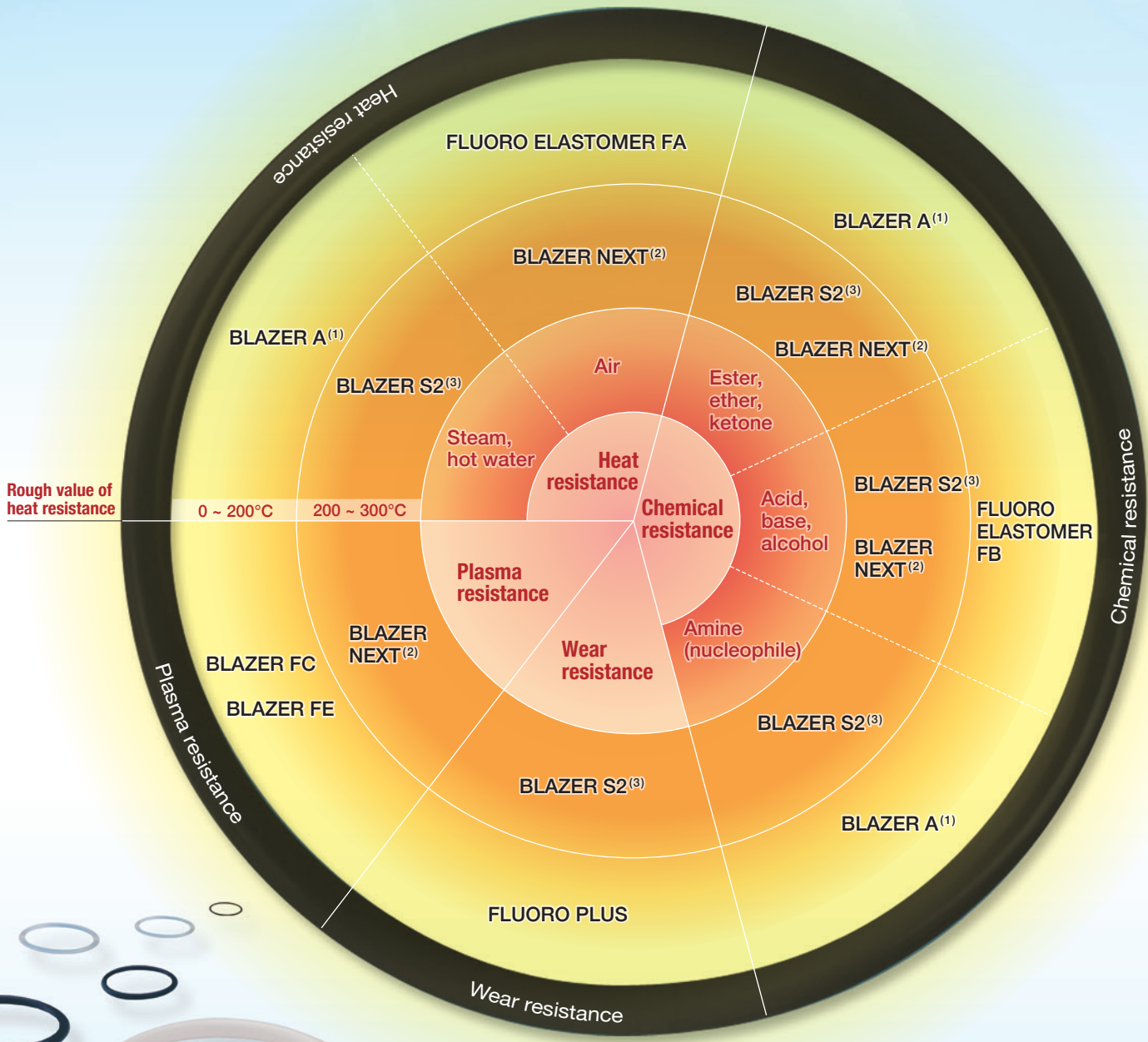
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**Correspondence table by resistance**



Note : (1) The rough value of heat resistance of BLAZER™ A is 210 °C  
 (2) The rough value of heat resistance of BLAZER™ NEXT is 335 °C  
 (3) The rough value of heat resistance of BLAZER™ S2 is 320 °C



# BLAZER™ O-ring-S2

TOMBO™ No.2675-S2

BLAZER™ S2, a PERFLUORO ELASTOMER, exhibits stable sealing performance when exposed to high-temperature steam or a nucleophilic agent. The new cross-linking agent and our unique blending technology are used for this, resulting in greatly improved steam resistance, RGD (rapid gas decompression) resistance, and toughness at high-temperature.

### Features

Rough value of heat resistance: 320°C

Standard hardness (Duro A): 80

Offers the broadest chemical compatibility, e.g., better resistance amines, esters, ethers, ketones, acids, bases, hydrocarbons, chlorine-based solvents, hot water and steam.

Provides excellent RGD resistance so parts maintain sealing properties and equipment life is extended.

Excellent toughness at high temperatures.



### Applications

Can be used as a seal in valves, pumps, turbo machinery, painting machines, centrifuges, agitators, analyzers, reaction furnaces, and the like.

### Steam resistance test results

Inspected in NICHIAS

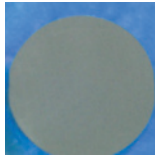
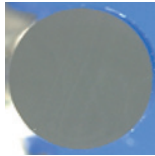
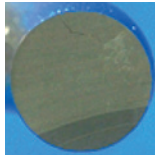
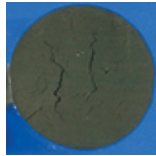
Testpiece			BRAZER™ S2	BRAZER™ S	Competitor's
320°C	72hours	Before			
		After			

**In an environment of high-temperature steam, competitor's undergoes hydrolysis and melt. In contrast, BLAZER™ S2 does not undergo hydrolysis.**

## Rapid pressure reduction characteristics test results

When the pressure of this elastomer in a high pressure environment is reduced rapidly, the gas which had permeated the elastomer due to the high pressure swells as a result of the rapid pressure reduction, which may cause blistering of the elastomer. As a result of being subjected to a rapid pressure reduction, the BLAZER™ S2 is found to have 1 or 2 damage points, and compared to other companies' perfluoro-elastomer, it is suitable for use in an environment in which the pressure is rapidly reduced.

Inspected in KOBELCO Research Institute, Inc.

Testpiece	BRAZER™ S2	BRAZER™ S	Competitor's	BRAZER™ NEXT
Cross-section O-rings after test				
Damage rating	1 or 2	1 or 2	1 or 2	3

### Evaluation criteria of the number of damage points

Number of points	Condition inside the sample after the test
1	No damage
2	No more than 1 crack or blister on the cut face
3	Cracks or blister on no more than 50% of the cut face
4	Cracks or blister on more than 50% of the cut face

### ● Test conditions

Heat the pressure vessel, then pressure-feed CO<sub>2</sub>, and leave standing.

Temperature: 100°C

Pressure: 15 MPa

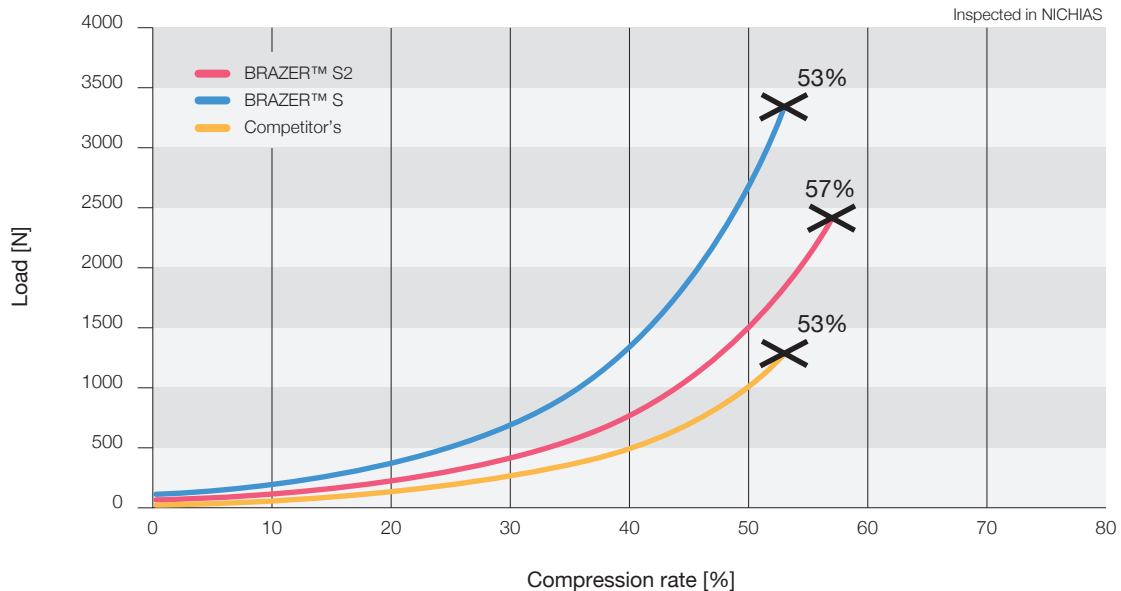
Fluid: Supercritical CO<sub>2</sub>

Holding period: 24 hrs

Pressure reduction rate: 7 MPa/min

Testpiece: Thickness φ3.53 mm × 30 mm Strip

## Evaluation results of resistance against compression force (at 300°C in an air)



### ● Test conditions

Testpiece: Thickness φ3.53 mm × 50 mm Strip

Atmosphere: Air

Compression rate: 0.1 mm / min

Temperature: 300 °C

**BLAZER™ S2 has excellent resistance against compression force at 300°C**



The BLAZER™ FC is a special FLUORO ELASTOMER (special FKM) O-ring intended for use in a plasma CVD unit which is a component unit of a semiconductor or LCD manufacturing unit. It exhibits high resistance to F-type and Cl-type plasma.



#### Features

Rough value of heat resistance: 200°C

Standard hardness (Duro A): 60

By using our own blending technology, the reduction of weight of the elastomer due to the plasma can be reduced and also made the cost of the product considerably less than that of PERFLUORO ELASTOMER.

This product has excellent non-adhesiveness, enabling it to be used effectively even on moving parts.

Contains only a small amount of metal, so particle issues are reduced.

#### Applications

Sealing of plasma CVD units



The BLAZER™ FE is a special FLUORO ELASTOMER (special FKM) O-ring intended for use in a plasma etching unit which is a component unit of a semiconductor or LCD manufacturing unit. It exhibits high resistance to O<sub>2</sub> type plasma.



#### Features

Rough value of heat resistance: 200°C

Standard hardness (Duro A): 60

By using our own blending technology, the reduction of weight of the elastomer due to the plasma can be reduced and also made the cost of the product considerably less than that of PERFLUORO ELASTOMER.

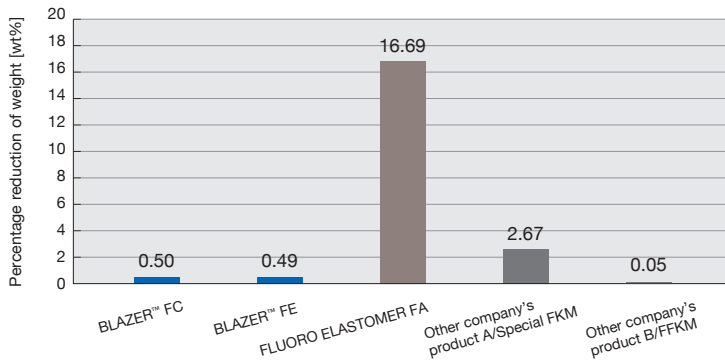
This product has excellent non-adhesiveness, enabling it to be used effectively even on moving parts.

Contains only a small amount of metal, so particle issues are reduced.

#### Applications

Sealing of plasma etching units

[Percentage reduction of weight after 120 minutes]



● Test conditions

Unit: Surface wave plasma etching unit  
 Testpiece: Thickness φ3.53 mm × 30 mm Strip  
 Type of gas: O<sub>2</sub> (2000 sccm) + CF<sub>4</sub> (40 sccm)  
 Pressure: 133 Pa  
 Output: 2000 W  
 Stage cooling water set temperature: 30°C  
 Exposure time: 120 minutes

[Exterior observation]

Inspected in NICHIAS

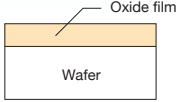
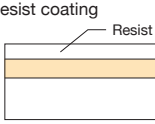
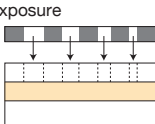
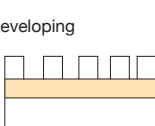
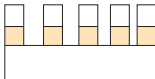
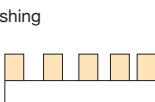
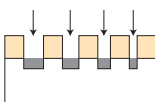
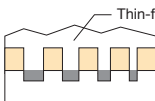
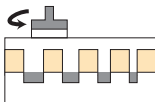
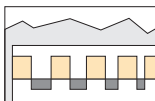
Product name	BLAZER™ FC	BLAZER™ FE	FLUORO ELASTOMER FA	Other company's product B/FFKM
Crack occurrence time [minutes]	40	No cracks	20	40
Before exposure				
After 20 minutes				
After 40 minutes				
After 60 minutes				
After 120 minutes				



● Test conditions

Unit: Surface wave plasma etching unit  
 Testpiece: O-ring AS568-214 (Thickness φ3.53 mm × I. D. 25.00 mm)  
 Type of gas: O<sub>2</sub> (2000 sccm) + CF<sub>4</sub> (40 sccm)  
 Pressure: 133 Pa  
 Output: 2000 W  
 Stage cooling water set temperature: 30°C  
 Exposure time: 2.0 hrs  
 Percentage elongation: 5%  
 Exterior observation: At 5-minute intervals to 20 minutes; Subsequently, at 10-minute intervals to 120 minutes

# Selection guide to elastomer O-rings used in a semiconductor manufacturing process

Process	Equipment	Applications	Recommended products	Characteristics of materials
Oxidation and diffusion 	Oxidation and diffusion furnace	Furnace body seal	BLAZER™ NEXT	<ul style="list-style-type: none"> <li>● Heat resistance</li> <li>● Low-discharge gas</li> </ul>
			FLUORO ELASTOMER FA	* Standard fluoro-elastomer
Lithography Resist coating  Exposure  Developing 	Coater	Chemical line seal Baking unit	BLAZER™ A	<ul style="list-style-type: none"> <li>● Solvent resistance</li> <li>● Purity</li> </ul>
	Stepper	Purge chamber seal	FLUORO ELASTOMER FA	<ul style="list-style-type: none"> <li>● Wear resistance</li> <li>● Non-adhesiveness</li> </ul>
	Developer	Chemical line seal	BLAZER™ A	<ul style="list-style-type: none"> <li>● Solvent resistance</li> <li>● Purity</li> </ul>
Etching Dry etching  Ashing 	Plasma etching unit	Seal in chamber ( Chamber lid, gate valve, peephole, etc. )	BLAZER™ FE	● Plasma resistance
			PERFLUORO PFW™	● Plasma resistance
			BLAZER™ NEXT	<ul style="list-style-type: none"> <li>● Heat resistance</li> <li>● Low-discharge gas</li> </ul>
	Plasma ashing unit	BLAZER™ FE	● Plasma resistance	
		PERFLUORO PFW™	● Plasma resistance	
		BLAZER™ NEXT	<ul style="list-style-type: none"> <li>● Heat resistance</li> <li>● Low-discharge gas</li> </ul>	
Ion implantation 	Thermal diffusion furnace Ion implanting unit	Seal in chamber	BLAZER™ NEXT	<ul style="list-style-type: none"> <li>● Heat resistance</li> <li>● Low-discharge gas</li> </ul>
			FLUORO ELASTOMER FA	* Standard fluoro-elastomer
Thin-film forming 	Metal CVD unit Plasma CVD unit Sputtering unit	Seal in chamber ( Chamber lid, peephole, etc. )	BLAZER™ FC	● Plasma resistance
			BLAZER™ NEXT	<ul style="list-style-type: none"> <li>● Heat resistance</li> <li>● Low-discharge gas</li> </ul>
			FLUORO ELASTOMER FA	* Standard fluoro-elastomer
Flattening 	CMP unit	Seal in chamber Chemical line seal	BLAZER™ A	<ul style="list-style-type: none"> <li>● Chemical resistance</li> <li>● Purity</li> </ul>
			FLUORO ELASTOMER FB	<ul style="list-style-type: none"> <li>● Acid resistance</li> <li>● Purity</li> </ul>
Washing 	Washing unit	Chemical line seal Filter seal	BLAZER™ A	<ul style="list-style-type: none"> <li>● Chemical resistance</li> <li>● Purity</li> </ul>
			FLUORO ELASTOMER FB	<ul style="list-style-type: none"> <li>● Acid resistance</li> <li>● Purity</li> </ul>



## Comparison of characteristics of high performance elastomer O-rings

### Elastomer O-rings for a wet process

Elastomer O-rings used in various processes such as lithography, washing and wet etching are required to have not only chemical resistance and purity but also ozone resistance, non-adhesiveness, and other properties, depending upon the particular application.

Characteristics that are used	Product name	Color	Rough value of heat resistance	Chemical resistance					Purity (eluted metal)	Non-adhesiveness
				Oil resistance	Acid resistance	Alkali resistance	Solvent resistance	Ozone resistance		
Chemical resistance	BLAZER™ A	Black	210℃	◎	◎	◎	◎	◎	◎	○
	FLUORO ELASTOMER FB	Black	200℃	◎	◎	○	○	○	◎	○
Ozone resistance	BLAZER™ A	Black	210℃	◎	◎	◎	◎	◎	◎	○
	PURE RUBBER™	Transparent	150℃	◎	◎	○	○	◎	◎	△
Non-adhesiveness	FLUORO PLUS™	Black	200℃	◎	○	△	△	△	△ (Mg, Ca)	◎
General purpose product	FLUORO ELASTOMER FA	Black	200℃	◎	○	△	△	△	△ (Mg, Ca)	○

■ Method of reading evaluation symbols: The symbols ◎, ○, and △ mean “most suitable,” “suitable,” and “unsuitable,” in that sequence. Note, however, that the evaluations in this table are intended only as a rough guide, and we are unable to guarantee the performance of the products for individual applications. For data concerning the resistance to various kinds of chemicals, refer to Page 15-16.

\* For details of general properties, refer to Page 17. For product No. indication method and allowable manufacturing dimensions, refer to Page 18.

### O-rings for a dry process

Elastomer O-rings intended for use in a dry process such as dry etching, ashing and CVD are required to have higher heat resistance and plasma resistance, and also low-discharge gas characteristics.

Characteristics that are used	Product name	Color	Rough value of heat resistance	Plasma resistance			Low-discharge gas characteristics	Vacuum sealing performance	Non-adhesiveness
				Oxygen	Fluorine	Chlorine			
Heat resistance	BLAZER™ NEXT	Black	335℃	◎	◎	◎	◎	○	○
Plasma resistance	PERFLUORO PFW™	White	200℃	◎	◎	◎	○	○	○
	BLAZER™ NEXT	Black	335℃	◎	◎	◎	◎	○	○
	BLAZER™ FC	Black	200℃	○ ~ ◎			○	○	○
	BLAZER™ FE	Black	200℃	○ ~ ◎	○	○	○	○	○
Non-adhesiveness	FLUORO PLUS™	Black	200℃	△	○	△	○	△	◎
General purpose product	FLUORO ELASTOMER FA	Black	200℃	△	○	△	○	◎	○

■ Method of reading evaluation symbols: The symbols ◎, ○, and △ mean “most suitable,” “suitable,” and “unsuitable,” in that sequence. Note, however, that the evaluations in this table are intended only as a rough guide, and we are unable to guarantee the performance of the products for individual applications. When actually using a product, it is recommended that you perform a check using a test carried out under actual conditions.

\* For details of general properties, refer to Page 17. For product No. indication method and allowable manufacturing dimensions, refer to Page 18.



# BLAZER™ NEXT

TOMBO™ No.2670 -BNX

BLAZER™ NEXT is PERFLUORO ELASTOMER which has excellent heat resistance and plasma resistance. It has good sealing performance even under severe environments, which is difficult to realize using other elastomer materials.

### Features

Rough value of heat resistance: 335°C

Standard hardness (Duro A): 76

Undergoes little compressive permanent strain when subjected to high temperature, and can therefore be expected to realize stable sealing performance over a long period.

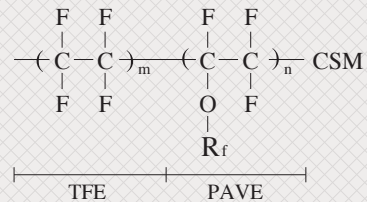
### Applications

Sealing of heat treatment units for manufacturing semiconductors and LCD concerning which heat resistance is particularly necessary (annealing furnaces, LPCVD units, etc.)

Sealing of units, piping and valves used in various industrial fields



### Chemical structure (PERFLUORO ELASTOMER overall)



CSM = Cross-linked site monomer

### 350°C free heating test

Inspected in NICHIAS

	BLAZER™ NEXT	Other company's product A	Other company's product B	Other company's product C
Before heating				
After heating for 72 hours				

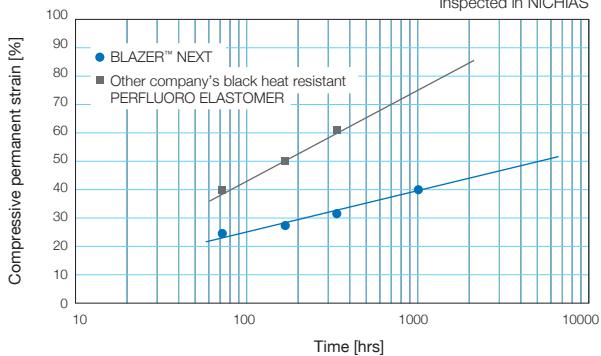
\* This data does not imply that use at 350°C is recommended.

### ⚠ Precaution for use

BLAZER™ NEXT undergoes large thermal expansion, so it may sometimes be subjected to excessive compression when used at high temperature (250°C or higher). Care must be taken, particularly when the compressibility (at normal temperature) is 20% or more. For details, please contact us.

### Compressive permanent strain test results

Inspected in NICHIAS



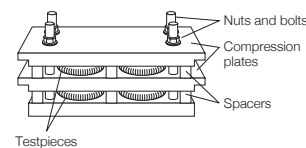
### ● Test conditions

Measuring jig: Refer to the figure below.

Testpiece: O-ring (AS568-214; Thickness φ3.53 mm × I. D. 25.0 mm)

Heating temperature: 300°C

Compressibility: 19% (at normal temperature), 25% (when heated)



$$\text{Compressive permanent strain (\%)} = \frac{t_0 - t_1}{t_0 - t_2} \times 100$$

t<sub>0</sub>: Original thickness of testpiece

t<sub>1</sub>: Thickness 30 minutes after the testpiece is removed from the compressor unit

t<sub>2</sub>: Thickness of the spacer

The high-temperature compressive permanent strain of the BLAZER™ NEXT is smaller than that of other company's black heat resistant PERFLUORO ELASTOMER (heat resistance temperature mentioned in catalog: 300°C), so this type of elastomer can be expected to realize stable sealing performance over a long period.



**BLAZER™  
O-ring-A**

TOMBO™ No.2675-A

This type of elastomer has excellent chemical resistance. Particularly, it is highly resistant to polar solvents such as amines and organic acids, which cannot be realized by other kinds of FLUORO ELASTOMER. It produces little elution of metal, and is suitable for applications which require both chemical resistance and purity.



**Features**

Rough value of heat resistance: 210°C

Standard hardness (Duro A): 75

Has excellent chemical resistance, enabling it to be used with almost all chemicals (excluding fluorine-based solvents).

Almost no metal is eluted into the chemical used.

**Applications**

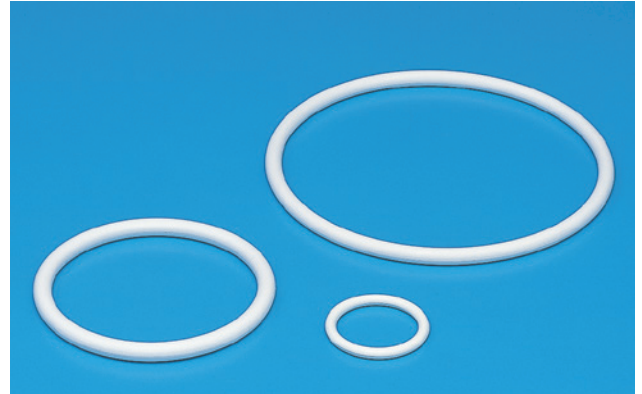
Sealing of washing units, coaters/developers, wet etching units, filters, etc.

Elastomer O-rings

**PERFLUORO  
PFW™**

TOMBO™ No.2670-PFW

Has excellent plasma resistance, and is used on dry etching units for manufacturing semiconductors.



**Features**

Rough value of heat resistance: 200°C

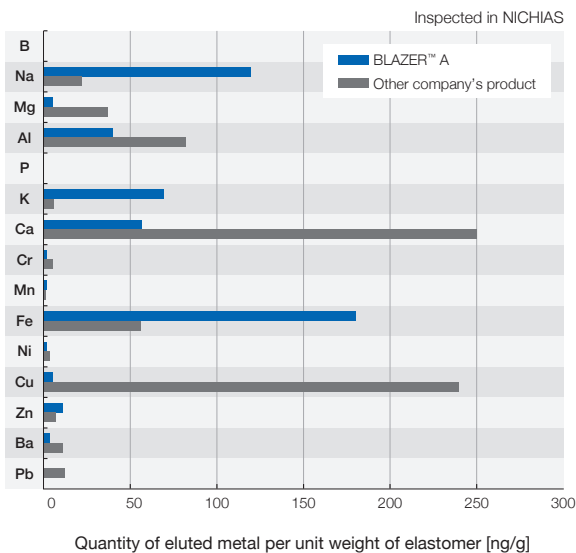
Standard hardness (Duro A): 70

Has excellent plasma resistance, and undergoes little reduction of weight when exposed to plasma.

**Applications**

Sealing of plasma etching units, plasma CVD units, and so on

**Results of measuring metal elution**



The results indicate that because BLAZER™ A does not contain metal in its formulation, it produces only a very small amount of metal ions compared to other company's product.

**● Test conditions**

- Pre-washing: None
- Elution
  - Testpiece: O-ring AS568-214 (Thickness φ3.53 mm × I. D. φ25.00 mm)
  - Chemical: 3.6% hydrochloric acid 100 g
  - Temperature × Time: 25°C × 20 hours
- Analysis method: ICP-MS

PURE RUBBER is a transparent elastomer consisting of a polymer formed by bonding FLUORO ELASTOMER to fluoro-resin. It employs radiation cross-linking, so it does not contain a cross-linking agent. Also, it contains no fillers or other additives whatever. It thus features a high degree of cleanliness. In addition, the fluoro-resin grains bonded to each other inside the polymer result in excellent ozone resistance and chemical resistance.

**Features**

Rough value of heat resistance: 150°C

Standard hardness (Duro A): 60

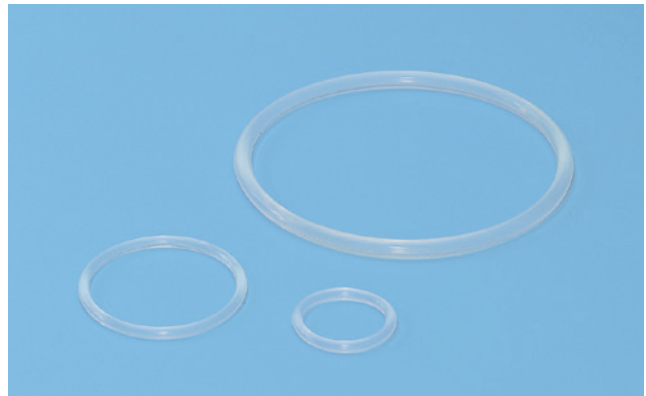
Because this elastomer does not contain a cross-linking agent, fillers or other additives, there is almost no eluted material.

Because this product consists of FLUORO ELASTOMER and fluoro-resin, it has excellent ozone resistance and chemical resistance.

**Applications**

Sealing of washing unit, etc.

Conveying rollers for LCD manufacturing units



**Chemical structure**

Hard segment: ETFE

Soft segment: Ternary FKM

**Ozone (wet atmosphere) exposure test results**

**Test conditions**

Exposure atmosphere: 10% ozone gas + Saturated steam / Temperature: 23°C / Time: 20 weeks (1 week in the case of FLUORO ELASTOMER FA)

PURE RUBBER		Before exposure	After 20 weeks' exposure, there is almost no change in the external appearance or the surface adhesion.		After 20 weeks' exposure
FLUORO ELASTOMER FA		Before exposure	After 1 week's exposure, the surface has dissolved, and there is adhesion.		After 1 week's exposure

Inspected in NICHIAS

FLUORO ELASTOMER FB is 3-way FLUORO ELASTOMER with improved chemical resistance realized by our independently developed blending technology. It has excellent resistance to hot acids and steam, which cannot be realized with general purpose FLUORO ELASTOMER. In addition, the amount of eluted material is very small, resulting in high performance fluoro-elastomer which has a high degree of purity.

### Features

Rough value of heat resistance: 200°C

Standard hardness (Duro A): 70

This product can be used in an environment consisting of hot inorganic acid, steam, sodium hydroxide, and other substances that corrode general purpose FLUORO ELASTOMER.

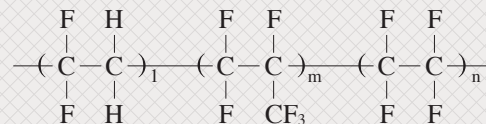
Almost no metal is eluted into the chemical used.

### Applications

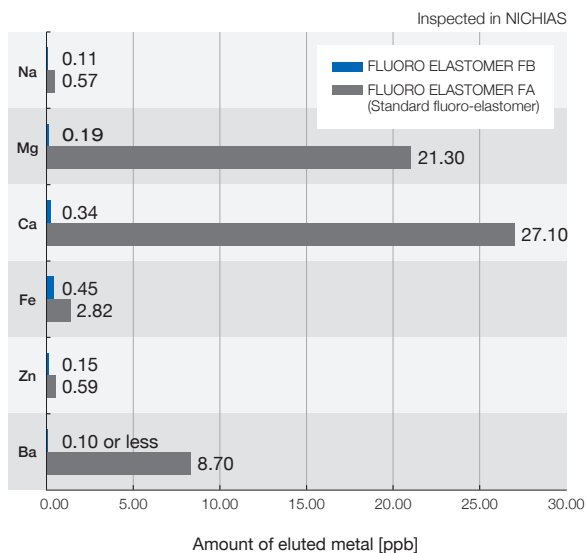
Washing units, wet etching units, filters, etc.



### Chemical structure



### Results of measuring eluted metal



Because FLUORO ELASTOMER FB does not contain metal in its formulation, the elution of metal ion is extremely small compared to that of FLUORO ELASTOMER FA, as indicated by the test results.

### Test conditions

- Pre-washing: The testpiece was washed in a 5% solution of hydrofluoric acid, and then washed in ultra-pure water.
- Elution
  - Testpiece: O-ring JIS P16  
(Thickness φ2.4 mm × I. D. φ15.8 mm)
  - Chemical: 50% solution of hydrofluoric acid 300 g
  - Temperature × Time: 24°C × 72 hours (3 days)
- Analysis method: ICP-MS

Low friction, non-adhesive  
FLUORO ELASTOMER

Low friction

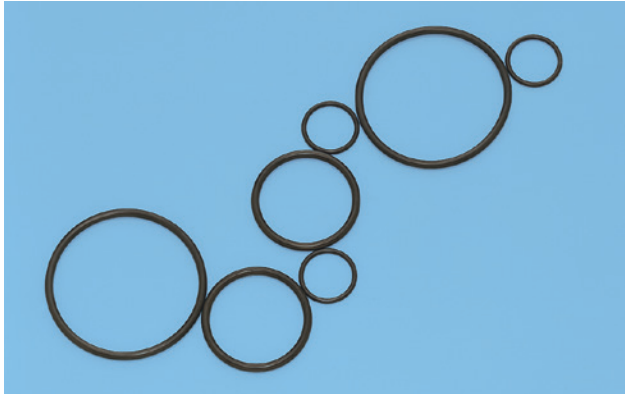
Non-adhesiveness

Elastomer O-rings

## FLUORO PLUS™

TOMBO™ No.2670-FA-F

FLUORO PLUS is a special type of FLUORO ELASTOMER which has greatly improved friction resistance and non-adhesiveness while retaining the chemical resistance and heat resistance of FLUORO ELASTOMER. FLUORO PLUS differs from a skin coating in that it is treated using a surface modification method, enabling its characteristics to be maintained for a long period, and also preventing separation of the surface layer.



### Features

Rough value of heat resistance: 200°C

Standard hardness (Duro A): 70

The coefficient of friction is approximately 1/2 of that of standard FLUORO ELASTOMER.

The adhesiveness to metal is approximately 1/5 of that of standard FLUORO ELASTOMER.

Because the surface is treated using a modification method, the surface layer will not separate.

### Applications

For sealing parts that slide intermittently, and also parts that are repeatedly opened and closed (Sealing various control valves)

Places where conventional elastomer sticks fast to metal, causing maintenance performance to deteriorate.



### Precaution for use

Compared to FLUORO ELASTOMER FA, FLUORO PLUS has inferior conformability with the mating face, so do not use it for a high vacuum seal.

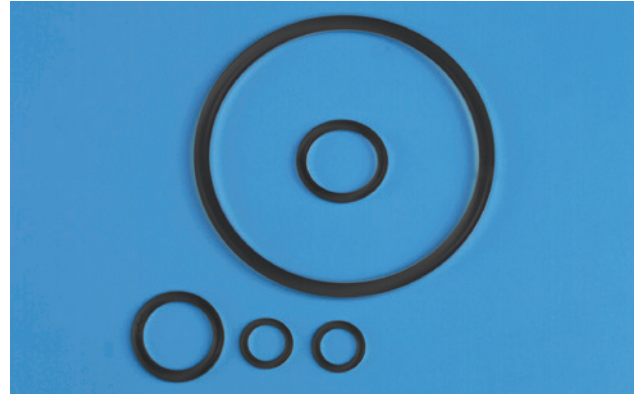
## General purpose FLUORO ELASTOMER

Elastomer O-rings

## FLUORO ELASTOMER FA

TOMBO™ No.2670-FA

FLUORO ELASTOMER FA is equivalent to FKM-70 in JIS B 2401 (O-rings). It is a 2-way FLUORO ELASTOMER O-ring which has excellent heat resistance, oil resistance, and vacuum sealing ability.



### Features

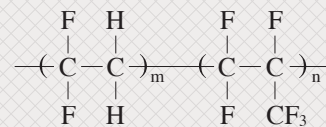
Rough value of heat resistance: 200°C

Standard hardness (Duro A): 70

### Applications

Sealing of vacuum equipment, heat treatment equipment, and so on.

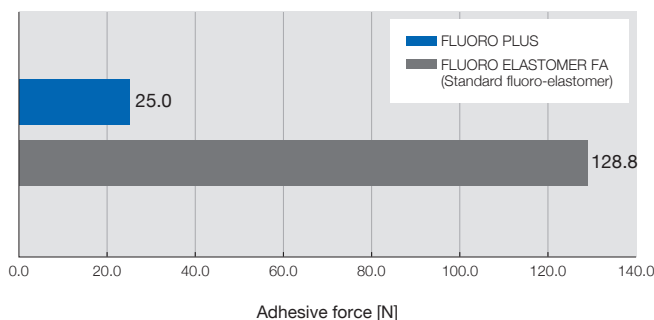
### Chemical structure



## Non-adhesiveness

### FLUORO PLUS vs FLUORO ELASTOMER FA

Inspected in NICHIAS



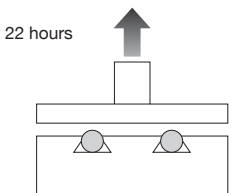
### Test conditions

Testpiece: O-ring JIS P26  
(Thickness φ3.5 mm × l. D. φ25.7 mm)

Compression ratio: 25%

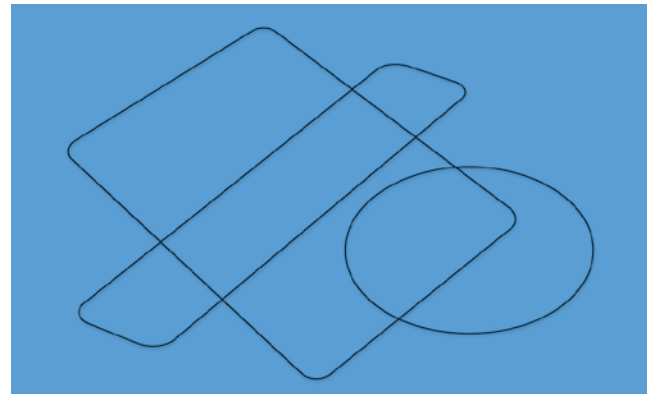
Flange material: Aluminum

Heating conditions: 200°C × 22 hours



# Large O-rings

Various types of original high performance elastomer can be joined together during the molding process. By molding two or more O-rings separately, and then joining them together and vulcanizing them, a large O-ring can be made without any need to fabricate a special die for each size of O-ring. This in turn enables the delivery time to be reduced.



### Features

I.D. can be set freely provided that it is within the allowable range of fabrication.

The delivery period for the part corresponding to die fabrication can be reduced.

The cost of die fabrication can be reduced.

### Applications

Sealing of large LCD manufacturing units

### Allowable range of fabrication

Product name	Thickness (mm)									I. D. that can be fabricated (mm)
	3.1	3.53	4.0	5.33	5.7	6.0	6.98	8.4	10.0	
BLAZER™ NEXT	—	○	—	○	○	—	○	○	○	400 or more
BLAZER™ S2	—	○	—	○	○	—	○	○	○	400 or more
BLAZER™ A	—	○	—	○	○	—	○	○	○	400 or more
BLAZER™ FC	—	○	—	○	○	—	○	○	○	400 or more
BLAZER™ FE	—	○	—	○	○	—	○	○	○	400 or more
PURE RUBBER™	○	○	○	○	○	○	○	○	○	50 (Thickness 6.0 or less) or more 100 (Thickness 6.99 – 8.4) or more 150 (Thickness 10.0) or more
FLUORO ELASTOMER FB	○	○	○	○	○	○	○	○	○	300 or more
FLUORO PLUS™	○	○	○	○	○	○	○	○	○	300 or more
FLUORO ELASTOMER FA	○	○	○	○	○	○	○	○	○	300 or more

\* For thickness other than the above, please contact us.

# Chemical resistance of various elastomer materials

This data concerns the chemical resistance of various elastomer materials which is judged overall based on the results of chemical immersion tests carried out in our test laboratory, existing publicized data, and actual data used. This chemical resistance data constitutes a very useful guide for selecting a elastomer material. However, regarding each individual application, there are conditions which cannot be created in our test laboratory, and it is not possible to guarantee the performance of the material for each customer's application. For this reason, if there is a possibility of damage or deterioration of the sealing parts causing major damage, it is recommended that prior to use you carry out tests under actual conditions and check the results.

Inspected in NICHIAS

Chemicals		Temperature [°C]	NICHIAS original high performance elastomer							Standard materials				
			BLAZER™ NEXT	BLAZER™ S2	BLAZER™ A	BLAZER™ FC	BLAZER™ FE	PURE RUBBER™	FLUORO ELASTOMER FB	FLUORO ELASTOMER FA	Silicone elastomer	Ethylene propylene elastomer	Chloroprene elastomer	Nitrile elastomer
Acids	Hydrochloric acid 37%	25	A	A	A	A	A	A	A	A	C	A	C	C
	Hydrochloric acid 37%	80	A	A	A	A	A	A	A	C	D	C	D	D
	Sulfuric acid 98%	25	A	A	A	A	A	A	A	A	D	C	D	D
	Sulfuric acid 98%	80	A	A	A	A	A	A	A	D	D	D	D	D
	Fuming sulfuric acid	25	A	A	A	B	B	A	B	C	D	D	D	D
	Nitric acid 60%	25	A	A	A	A	A	A	A	A	D	D	D	D
	Nitric acid 60%	80	A	A	A	A	A	B	A	D	D	D	D	D
	Hydrofluoric acid 50%	25	A	A	A	A	A	A	A	A	D	D	D	D
	Glacial acetic acid	25	A	A	A	D	D	D	D	D	B	C	D	D
	Anhydrous acetic acid	25	A	A	A	D	D	D	D	D	C	A	D	D
	Phosphoric acid	25	A	A	A	A	A	A	A	A	C	A	D	D
	Phosphoric acid	80	A	A	A	A	A	A	A	A	D	A	D	D
	Formic acid	25	A	A	A	A	A	A	A	C	C	C	B	C
Aqua regia	25	A	A	A	A	A	A	A	B	D	D	D	D	
Alkalis	Sodium hydroxide 50%	25	A	A	A	A	A	A	A	A	-	A	-	-
	Sodium hydroxide 50%	80	A	A	A	A	A	A	A	D	D	A	-	D
	Hypochlorous acid 10%	25	A	A	A	A	A	A	A	A	D	A	D	D
	Aqueous ammonia 28%	25	A	A	A	B	B	B	B	D	A	A	D	A
	Ammonium fluoride	25	A	A	A	A	A	A	A	A	-	A	-	-
Alcohols	Methanol	25	A	A	A	A	A	A	A	D	A	A	A	A
	Ethanol	25	A	A	A	A	A	A	A	A	A	A	A	A
	Isopropyl alcohol	25	A	A	A	A	A	A	A	A	B	A	B	B
Amines	n-methyl-2- pyrrolidone	25	A	A	A	D	D	D	D	D	-	A	-	-
	Ethylene diamine	25	A	A	A	D	D	D	D	D	B	A	B	B
Aldehyde furan	Tetrahydrofuran	25	A	A	A	D	D	D	D	D	D	C	D	D
	Acetaldehyde	25	A	A	A	D	D	D	D	D	D	A	D	D
	Furfural	25	A	A	A	B	B	B	B	D	D	A	D	D



## How to read evaluation symbols

<b>A ... Percentage change of volume 0 – 10%</b>	The external appearance is virtually unchanged. It is predicted that under severe pressure or temperature conditions the physical characteristics of the material will deteriorate slightly.
<b>B ... Percentage change of volume 10 – 20%</b>	The physical characteristics of the material deteriorate markedly, so the material cannot be recommended for dynamic applications.
<b>C ... Percentage change of volume 20 – 40%</b>	The physical characteristics deteriorate to an extreme degree, so the material is not recommended for dynamic applications. This material can sometimes be used for static applications over a short period of time.
<b>D ... Percentage change of volume 40% or higher</b>	The material cannot be used.

Inspected in NICHIAS

Chemicals		Temperature [°C]	NICHIAS original high performance elastomer							Standard materials				
			BLAZER™ NEXT	BLAZER™ S2	BLAZER™ A	BLAZER™ FC	BLAZER™ FE	PURE RUBBER™	FLUORO ELASTOMER FB	FLUORO ELASTOMER FA	Silicone elastomer	Ethylene propylene elastomer	Chloroprene elastomer	Nitrile elastomer
Ketone, ester, ether	Acetone	25	A	A	A	D	D	D	D	D	C	D	D	D
	Methyl ethyl ketone	25	A	A	A	D	D	D	D	D	D	D	D	D
	Methyl isobutyl ketone	25	A	A	A	D	D	D	D	D	D	D	D	D
	Butyl acetate	25	A	A	A	D	D	D	D	D	D	D	D	D
	Ethyl lactate	25	A	A	A	D	D	D	D	D	D	D	D	D
	Cyclohexanone	25	A	A	A	D	D	D	D	D	D	D	D	D
	Propylene glycol monomethyl ether	25	A	A	A	D	D	D	D	D	-	D	-	-
	Propylene glycol monomethyl ether acetate	25	A	A	A	D	D	D	D	D	-	D	-	-
Hydrocarbons	Cyclohexane	25	A	A	A	A	A	A	A	A	D	D	D	B
	Isooctane	25	A	A	A	A	A	A	A	A	D	D	D	A
	Benzene	25	A	A	A	A	A	A	A	C	D	D	D	D
	Toluene	25	A	A	A	A	A	A	A	C	D	D	D	D
Chlorine-based solvent	Chloroform	25	A	A	A	B	B	A	B	B	D	D	D	D
	Carbon tetrachloride	25	-	-	B	B	B	B	B	A	D	D	D	D
	Silicon tetrachloride	25	-	-	B	B	B	B	B	A	D	D	D	D
	Methylene chloride	25	A	A	A	B	B	C	B	D	D	D	D	D
	Trichloroethylene	25	A	A	A	B	B	B	B	C	D	D	D	D
Steam	Steam	150	A	A	A	A	A	D	A	B	D	-	D	D
	Steam	250	-	A	D	-	-	-	-	-	-	-	-	-
Other chemical related to semiconductor manufacture	Hexamethyldisilazane	25	A	A	A	A	A	A	A	A	-	-	-	-
	Piranha solution [H <sub>2</sub> SO <sub>4</sub> : H <sub>2</sub> O <sub>2</sub> = 3:1]	25	A	A	A	A	A	A	A	A	-	-	-	-
	SC-1 [NH <sub>4</sub> OH (27%) : H <sub>2</sub> O <sub>2</sub> (30%): H <sub>2</sub> O = 1 : 1 : 5]	25	A	A	A	A	A	A	A	A	-	-	-	-
	SC-2 [HCl(37%): H <sub>2</sub> O <sub>2</sub> (30%): H <sub>2</sub> O = 1 : 1 : 6]	25	A	A	A	A	A	A	A	A	-	-	-	-
	BHF [HF-NH <sub>4</sub> F-H <sub>2</sub> O]	25	A	A	A	A	A	A	A	A	-	-	-	-
	DHF [HF-H <sub>2</sub> O]	25	A	A	A	A	A	A	A	A	-	-	-	-

# Physical properties of elastomer materials

## NICHIAS original high performance elastomer

Type of material	NICHIAS product name	BLAZER™ NEXT	BLAZER™ S2	BLAZER™ A	PERFLUORO PFW™	BLAZER™ FC	BLAZER™ FE	PURE RUBBER™	FLUORO ELASTOMER FB	FLUORO PLUS
	NICHIAS material symbol	BNX	BS2	BA	PFW	BFC	BFE	TPFE	FB	FA-F
	Features	Heat resistance	Steam resistance	Chemical resistance	Plasma resistance	Plasma resistance	Plasma resistance	Ozone resistance and acid resistance	Steam resistance and acid resistance	Non-adhesiveness
JIS symbol	—	—	—	—	—	—	—	—	—	—
Color	Black	Black	Black	White	Black	Black	Transparent	Black	Black	
Working temperature range (°C)	0~335	0~320	0~210	0~200	0~200	0~200	0~150	0~200	-15~200	
Normal physical properties	Type A durometer hardness	76	82	75	71	60	60	62	70	70
	Tensile strength (MPa)	11.1	27.5	13.1	9.8	18.8	11.4	17.3	15.7	16.6
	Elongation (%)	140	200	150	150	210	230	590	460	210
	100% tensile stress (MPa)	8.3	15.6	6.4	5.9	3.9	3.5	1.6	2.8	3.9
Compression set characteristics	Test conditions (Temperature in °C × Time in hrs)	300×72	300×72	150×72	200×72	100×72	100×72	100×72	175×24	175×72
	Compression set (%)	26	45	20	25	9	9	34	20	8
Aging resistance	Test conditions (Temperature in °C × Time in hrs)	—	—	—	230×24	—	—	—	230×24	230×24
	Type A durometer hardness change	—	—	—	-5	—	—	—	0	+2
	Tensile strength percentage change (%)	—	—	—	-6.5	—	—	—	-13.0	-13.0
	Elongation percentage change (%)	—	—	—	+4.5	—	—	—	-6.0	-15.5

## Standard materials

Type of material	NICHIAS product name	FLUORO ELASTOMER FA	Silicone elastomer	Ethylene propylene elastomer	Chloroprene elastomer	Nitrile elastomer
	NICHIAS material symbol	FA	SI	EP	CR	NBR
	Features	Heat resistance	Heat resistance	Weather resistance and water resistance	Weather resistance and oil resistance	Mineral oil resistance
JIS symbol	FKM-70	VMQ-70	EPDM-70	—	NBR-70-1	
Color	Black	Reddish brown	Black	Black	Black	
Working temperature range (°C)	-15~200	-50~200	-40~150	-30~120	-30~120	
Normal physical properties	Type A durometer hardness	69	70	70	67	68
	Tensile strength (MPa)	15.3	6.3	15.3	12.8	16.4
	Elongation (%)	300	260	280	260	300
	100% tensile stress (MPa)	3.3	—	—	4.2	3.0
Compression set characteristics	Test conditions (Temperature in °C × Time in hrs)	200×72	175×72	100×72	100×72	120×72
	Compression set (%)	22	27	8	29	13
Aging resistance	Test conditions (Temperature in °C × Time in hrs)	230×72	230×72	100×72	100×72	120×72
	Type A durometer hardness change	+1	-6	+1	+9	+4
	Tensile strength percentage change (%)	-5	-8	+9	+8	-3
	Elongation percentage change (%)	±0	-23	+4	-23	-29

### ■ Test method

- Type A durometer hardness: JIS K 6253 (Elastomer, vulcanized or thermoplastic – Determination of hardness – Part 3: Durometer method)
- Tensile strength, elongation, 100% tensile stress: JIS K 6251 (Elastomer, vulcanized or thermoplastics – Determination of tensile stress-strain properties)
- Compression set: JIS K 6262 (Elastomer, vulcanized or thermoplastic – Determination of compression set at ambient, elevated or low temperatures)
- Thermal aging characteristics: JIS K 6257 (Elastomer, vulcanized or thermoplastic – Determination of heat ageing properties)

## Product No. (TOMBO™ No.) indication method

NICHIAS product name	BLAZER™ NEXT	BLAZER™ S2	BLAZER™ A	PERFLUORO PFW™	BLAZER™ FC	BLAZER™ FE	PURE RUBBER™	FLUORO ELASTOMER FB	FLUORO PLUS	FLUORO ELASTOMER FA	Silicone elastomer	Ethylene propylene elastomer	Chloroprene elastomer	Nitrile elastomer
O-rings	2670 -BNX	2675 -S2	2675 -A	2670 -PFW	2675 -FC	2675 -FE	2670 -TPFE	2670 -FB	2670 -FA-F	2670 -FA	2670 -SI	2670 -EP	2670 -CR	2670 -NBR
Molded products other than O-rings	2680 -BNX	2685 -S2	2685 -A	2680 -PFW	2685 -FC	2685 -FE	—	2680 -FB	2680 -FA-F	2680 -FA	2680 -SI	2680 -EP	2680 -CR	2680 -NBR

\* PURE RUBBER is used only for O-rings.

## Allowable manufacturing dimensions

Product shape		Allowable manufacturing dimensions		Remarks
		Width × Length	Thickness	
O-rings		JIS B 2401 (P, G, V), AS 568 B, others		Regarding original high performance elastomer, dies of certain dimensions are not available, so please check when ordering.
Molded products other than O-rings		Various shapes and dimensions (drawing instructions)		
Elastomer sheet	High performance elastomer	300mm × 300mm	1.0, 1.5, 2.0, 3.0 (mm)	
	Standard elastomer	1000mm × 1000mm	1.0, 1.5, 2.0, 3.0 (mm)	

## To ensure safe use

To ensure that the products in this catalog maintain their intended performance and can be used safely, be sure to strictly observe the following items.

- The physical properties and applications indicated in this catalog are representative properties and applications.
- The rough values of heat resistance indicated in this catalog are for reference only. They are not guaranteed values. Performance data is based on the results of tests performed by NICHIAS and also actual records obtained from general applications.
- These products are used in a variety of locations and equipment. The actual conditions of use differ from one application to another, so it is recommended that before using a product you carry out a test under the actual conditions of use.
- Concerning individual applications, it is necessary to evaluate each individual design and its suitability before selecting a product. For special applications, please contact us.
- The contents of this catalog may be changed without prior notice.



### Precautions for handling products

Please observe the following cautions in order to maintain the intrinsic functions of the products and also to ensure that these products are used safely.

1. Do not use a product for any other purpose than the ones described in the catalog and specification, etc.
2. Store products indoor at ambient temperature and humidity to avoid direct rays, and strictly avoid to get wet.
3. This product is washed and packaged in a clean room. Therefore, to avoid adhering to contaminations, be sure to open the package just before using products.
4. Do not damage the surface of products.
5. Avoid twisting of products when installing.
6. For disposal, follow local regulations.

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