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Elastomer Products



"VALQUA" is a compounded word coming from VALUE and QUALITY
which is the symbol and motto of the company.

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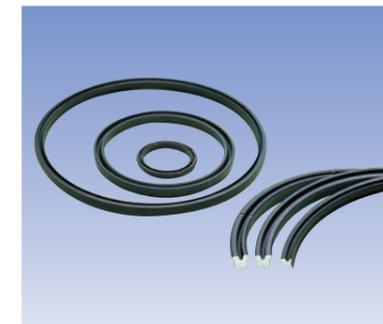
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Hydraulics and Pneumatics Related Products

Types and characteristics of hydraulic packing

Hydraulics equipment see use under a wide variety of conditions, and the hydraulic packing selected must be appropriate for the equipment's scope of applicable usage conditions.

For example, symmetrical U-Packing has typically been the traditional choice for hydraulic cylinder U-Packing as it can be used for both rods and pistons. However, with respect to cylinders used for heavy machinery, construction equipment, and other equipment used under harsh conditions, asymmetrical U-Packing has often been the conventional choice.



U-Packing / dust seal



MV-Packing

Use	Name	Cross-Sectional Shape	Series	Characteristics	Material	VALQUA Product Number
For Pistons	U-Packing		UHP	General-use type U-Packing. Compatible with integrated grooves.	TOUGHRETHANE™	E9625 TE9625
			UNP	U-Packing for high-pressure use.	Nitrile Rubber Super Rubber Fluoro Rubber	2060 2060 4060
			MLP	U-Packing for high-pressure use. Based on the JOHS-110 "Hydraulic Cylinder for Iron and Steel-Making Equipment (Heavy Machinery)" dimensions.		
For Pistons	SLIPPER SEAL™		APS	A 1-Ring type dual pressure seal for low pressure use.	(Slider Ring) -VALFLON™ (Back Ring)	7740
			APL	A 1-Ring type dual pressure seal for high pressure use.	-Nitrile Rubber -Fluoro Rubber (Back-up Ring)	
			APT	A 1-Ring type dual pressure seal for high-pressure use. This product, now with a back ring for enhanced reliability, helps prevent extrusions.	Polyamid	7740T
For rods	U-Packing		UHR	General-use type U-Packing. Compatible with integrated grooves.	TOUGHRETHANE™ Nitrile Rubber Super Rubber Fluoro Rubber	E9625 TE9625 2060 2060 4060
			UNR	U-Packing for high-pressure use.		
			MLR	U-Packing for high-pressure use. Based on the JOHS-110 "Hydraulic Cylinder for Iron and Steel-Making Equipment (Heavy Machinery)" dimensions.		
For pistons and rods	U-Packing		UHS	Symmetrical-lip U-Packing that is compatible with integrated grooves.		
			UNS	Symmetrical-lip U-Packing for high-pressure use.		
	V-Packing		VNV	Cloth-filled rubber V-Packing. Can be used in multiple layers.	Cloth-filled nitrile Rubber	2630
			VNF		Cloth-filled fluoro Rubber	4630
	V-Packing		VGH	Synthetic rubber V-Packing. Can be used in multiple layers.	Nitrile Rubber	2631
					Fluoro Rubber	4631
MV-Packing		MV	This product is a special, high-performance combination seal. Standard use involves combining it with 2 layers of cloth-filled rubber V-Packing. The grooves of the V-Packing can be used as-is.	Nitrile Rubber Super Rubber Fluoro Rubber	2632 2632 4632	
For rods	Dust Seal		DHS	This product is a dual-lip type, with both a duster lip and an oil lip, with superior dust resistance and is constructed to be oil leak-resistant.	TOUGHRETHANE™ Nitrile Rubber Fluoro Rubber	E9625 2060 4060
			DRL	A duster lip equipped, single-lip type product.	TOUGHRETHANE™	P9625
			DSL	A press-fit type product comprised of a single-lip, duster lip type to which metallic guides were attached.	TOUGHRETHANE™	P9625

☆TOUGHRETHANE™, a trademark of VALQUA, is a urethane rubber product processed and sold by VALQUA.
VALFLON™, a trademark of VALQUA, is a fluororesin product processed and sold by VALQUA.
SLIPPER SEAL™, a trademark of VALQUA, is a seal combining rubber rings together with VALFLON™ rings.

Types and characteristics of pneumatic packing



One-Ring Packing TOUGHRILE™



Cushion Packing

Sealants used in pneumatic equipment are expected to be compact, have high sealing performance, economical, and with low sliding friction so as to allow operation even in low-pressure environments. As a result, materials selection, optimized form design, and a high degree of dimensional accuracy all corresponding to the intended use are necessary.

Use	Name	Cross-Sectional Shape	Series	Characteristics	Material	VALQUA Product Number
For Pistons	Small diameter One-Ring packing		PSP	This product is small-diameter piston packing for dual-pressure type 1-Rings, and can be applied to uncut tubes with rough dimensional accuracy and surface smoothness.	Super Rubber	2060
					Nitrile Rubber	
					Fluoro Rubber	
		PWP	This product is small-diameter piston packing for dual-pressure type 1-Rings, with limited installation space and reduced sliding friction.	Abrasion-resistant Nitrile Rubber TOUGHRILE™	2060	
UPP	This product is asymmetrical packing for large cross-sections, and can be used for general-use pneumatic cylinders.	Nitrile Rubber	2060			
For rods	One-Ring packing		PUD	This product is an oilless rod packing with a duster lip, with limited installation space.	Abrasion-resistant Nitrile Rubber TOUGHRILE™	2060
					Super Rubber	
	UPR	This product is asymmetrical packing for large cross-sections, and can be used for general-use pneumatic cylinders.	Nitrile Rubber	2060		
	Cushion Packing		CPC	Cushion packing for use in general-use pneumatic cylinders.	Nitrile Rubber	2060
					CPF	
	Dust Seal		DPS	A dust seal for use in general-use pneumatic cylinders.	Nitrile Rubber	2060
DHS					This product should be used for large diameter pneumatic cylinders (rod diameter φ 50 or greater) and general-use industrial equipment.	
					Fluoro Rubber	4060

☆TOUGHRILE™, a trademark of VALQUA, is an oilless packing made by VALQUA. As TOUGHRILE™ is a strategic material (or investment) as defined by the Foreign Exchange and Foreign Trade Act, any export will require export approval in accordance with the Act.

Our company, since our founding in 1927, started off producing synthetic rubber V-Packing which led us to be one of the first to begin production on O-Rings, with VALQUA actually being the first company in Japan to receive JIS approval for JIS-standard O-Rings.

In 1964, we received Defense Agency certification for airplane-use O-Rings MIL-P-5516B Class B AN6227 and AN6230 hydraulics O-Rings, and began production of MIL-standard airplane-use O-Rings. Even now, with our airplane-use packing still leading our product lineup, we continue making products under stringent product quality management for a variety of industries, such as general-use industrial products, nuclear power-related products, and semiconductor manufacturing-related products.



Note) The VALQUA SG Series is the series version of O-Rings with particularly thin wire diameters in order to meet our customer's requests for miniaturization of equipment.

Type	Standard	For general equipment		For automobile	For aircraft
	JIS B2401	VALQUA SG standards	JASO F404	AS568A	
BY MATERIALS	For General-use	Class 1 A Class 1 B	Nitrile Rubber (NBR)	Class 1 A	Nitrile Rubber (NBR)
	For Fuel Use	Class2	Nitrile Rubber (NBR) Fluoro Rubber (FKM) Fluorosilicone Rubber (FVMQ)	Class 2	Nitrile Rubber (NBR) Fluoro Rubber (FKM) Fluorosilicone Rubber (FVMQ)
	For Animal and Plant Oils	Class3	Ethylene Propylene Rubber (EPDM) Styrene Butadiene Rubber (SBR)	Class 3	Ethylene Propylene Rubber (EPDM) Styrene Butadiene Rubber (SBR)
	For Heat Resistance	Class 4 C	Silicone Rubber (VMQ)	Class 4 C	Silicone Rubber (VMQ)
	For Heat Resistance and Oil Resistance	Class 4 D	Fluoro Rubber (FKM) Acrylic rubber (ACM)	Class 4 D Class 4 E	Fluoro Rubber (FKM)
	For Coolants	—	—	Class 5	—
BY USE		P (moving part) G (fixed part) V (vacuums) ISO (general industrial)	For fixed part	For moving part For fixed part	For moving part For fixed part

Large-diameter O-Rings (inner diameter dimensions of φ300 or more) can be made in the customer's desired dimensions with no limitations on maximum diameter dimensions through specialized vulcanization molding. Note that there are no differences in performance or quality when compared with products made through vulcanization molding using general-use presses.

Color O-Ring

This product series takes the traditionally black O-Rings and differentiates their component rubber materials by color. This will make identifying O-Ring materials easier, preventing installation errors and other mistakes. Furthermore, the white-colored product is frequently used as sealant for semiconductor equipment due to its efficacy at managing problems with contamination.

Rubber Materials	VALQUA Material Symbol	Color Tone	Application
Silicone Rubber (VMQ)	E0170	Reddish Brown	JIS B 2401 Class 4C Equivalent
	E0870	White	JIS B 2401 Class 4C Equivalent
Fluoro Rubber (FKM)	D9070	Brown	JIS B 2401 Class 4D Equivalent
	D9270	White	JIS B 2401 Class 4C Equivalent

Note) We accept requests for materials other than those described above (such as acrylic rubber).

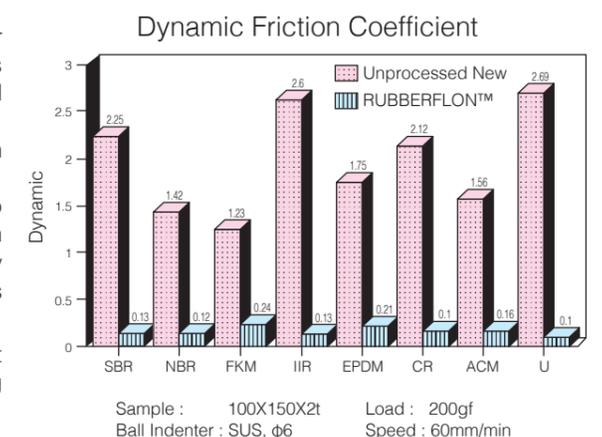
NEW RUBBERFLON™ O-Ring

When conducting continuous automatic installation of rubber products, the production line can see stoppages due to products becoming twisted during installation caused by strong resistance, and adhesion between products.

The NEW RUBBERFLON™ O-Ring has had its surface modified in order to eliminate such defects.

This product reacts with nearly all elastomers, like nitrile, fluoro rubber, and acrylic rubber, and forms a tightly bonded film. This film retains high followability even after being extended, leaving it unlikely to separate after installation, and is typically used in stationary seals (gaskets).

Uses: 1. Continuous Automated Installation Lines, 2. Component Supply Lines, 3. Oil and Grease, 4. Equipment Seal Anchoring Prevention



Note) NEW RUBBERFLON™ is not a surface quality modification of fluorine based products.

Semiconductor Industry Related Products

As the world transitions towards a high technology information society, the semiconductor industry has experienced continuous and rapid technological growth. It can be said that this phenomenon is caused by the unification and joint advancement of research and development for semiconductor manufacturing equipment and processing technology.

Even for soft sealants, the need for contamination control, in addition to high chemical resistance and heat resistance, grows ever more vital. By consolidating the technologies we have developed over our many years of business, we have worked on meeting these needs.

ARMOR™ Series

Contamination control on liquid crystal display production lines has become a significant issue in recent years due to increases in glass substrate sizes, and the use of high density plasma during processing, among other reasons. As a result, sealants used in liquid crystal display and semiconductor manufacturing equipment are expected to have high degrees of purity (low amounts of components that could become contaminants on wafer surfaces) and low particle properties (low likelihood of particles arising from sealants due to the use of plasma gas and friction).

As demands for these properties continue to increase in recent years, we developed the ARMOR™ Series for use in liquid crystal display and semiconductor manufacturing equipment. Using the Series' stellar performance capabilities and outstanding cost performance as sealant products for liquid crystal display and semiconductor manufacturing equipment, we hope to contribute to improving your company's productivity and yield.

ARMOR™ Series Products

	ARMOR CRYSTAL™	SPOQ ARMOR™	HYREC ARMOR™	ULTIC ARMOR™	LABE ARMOR™	FLID ARMOR™
Grade	Particle Measures	Plasma Resistant	Heat Resistant, Plasma Resistant (exclusively for fixed components)	Heat Resistant, Plasma Resistant	Exclusively for Oxygen Plasma Resistance	Special Low Friction
Color	Transparent Amber	White	Transparent Dark Amber	Transparent Dark Amber	Blue	Black
Hardness (Shore A)	60, 70	71	58	70	75	73
Characteristics	-Highly superior purity (no filler included) -Plasma resistant -Non-adherent (to metals)	-Non-adherent (to quartz) -High purity -Plasma resistant	-Heat resistant -High purity -Non-adherent (to metals) -Plasma resistant	-Heat resistant -High purity -Non-adherent (to metals) -Plasma resistant	-Oxygen plasma resistant -Non-adherent (to quartz)	-Low friction -Abrasion resistant -Non-adherent (to metals)
Primary Uses	Plasma gas environments and locations that require high purity and low adhesion in equipment for etching, ashing, CVD, etc.			Plasma gas environments in ashing equipment.	Locations not exposed to plasma gas in vacuum equipment. Optimal for dynamic locations.	

The values listed in the table are all actual values, and are not standard values.



ARMOR CRYSTAL™



SPOQ ARMOR™



HYREC ARMOR™



ULTIC ARMOR™



LABE ARMOR™



FLID ARMOR™

Performance Comparison between the ARMOR™ Series and Other Materials

	ARMOR™ Series							
	ARMOR CRYSTAL™	SPOQ ARMO™	HYREC ARMOR™	ULTIC ARMOR™	LABE ARMOR™	FLID ARMOR™		
High purity	Gas emission degree	A	B	A	A	B	B	
	Quantity of metallic components included	A	B	A	A	B	B	
Plasma resistant	O ₂	Etch rate	B	B	B	A	C	
		Particle Quantity	A	A	A	A	B	C
	CF ₄	Etch rate	B	B	B	B	C	C
		Particle Quantity	A	A	A	A	C	C
Abrasion resistant		B	B	C	B	B	A	
Target Maximum Allowable Working Temperature		160°C	200°C	200°C	200°C	200°C	200°C	

*Ranks Listed in Table BEST A to Fair C

VALQUA Bonded Gate Seal (High-performance transfer gate valve)



Characteristics and Uses

Material	Color	Primary Uses	Characteristics
ULTIC ARMOR™	Transparent amber	CVD	-High-purity -Particle-free -Contact prevention between gate plate and chamber -Reduction in surface area exposed to corrosive media
FLID	Black	PVD, Load-lock	-Abrasion resistant -Contact prevention between gate plate and chamber -Reduction in surface area exposed to corrosive media

FLUORITZ™ Series

As the various areas of industry experience technological revolutions, the characteristics demanded of rubber sealants grow more unforgiving. In recent years, we have begun to see more and more instances where even fluoro-rubber, touted for its heat and chemical resistance properties, is no longer useable for certain purposes. FLUORITZ, which is a perfluoroelastomer (FFKM), touts a wide-range and highly superior chemical resistance due to its superior chemical stability, and demonstrates superior sealing capabilities under high-temperature use.

Introducing the Products of the FLUORITZ™ Series

	FLUORITZ™-SB	FLUORITZ™-TR	FLUORITZ™-HS
Grade	Standard	Crack Resistance	Heat Resistance
Color	Black	Dark Brown	Black
Actual Hardness	77	72	77
ValuesTarget Working Temperature	0 – 200°C	0 – 260°C	0 – 300°C
Characteristics	- Superior chemical resistance	- Superior crack resistance - Superior purity	- Superior heat resistance
Primary Uses	Semiconductor and LCD, chemical industry, electricity and electronics related uses	CVD and dry etching equipment	Semiconductor and LCD manufacturing equipment (PE-CVD, LP-CVD diffusion furnaces, etc.)

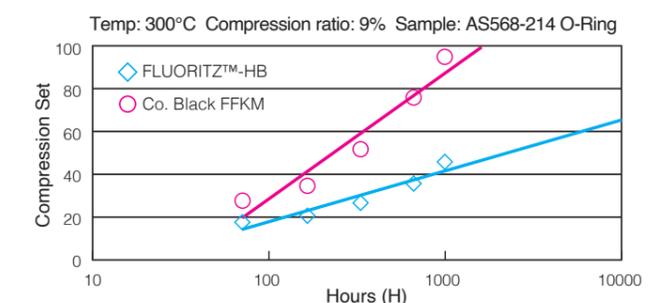
The values listed in the table are all actual measured values, and are not standard values.

Chemical Resistance of FLUORITZ™-SB

Chemicals	Conditions	FLUORITZ™-SB	Standard Fluoro Rubber
Methyl ethyl ketone	RT × 168 h	A	D
Methanol	RT × 168 h	A	D
Ethyl acetate	RT × 168 h	A	D
Di-n-butyl ether	RT × 168 h	A	A
Ammonia water (30%)	40°C × 168 h	A	D
Sodium hydroxide (50%)	40°C × 168 h	A	A
Hydrochloric acid (35%)	40°C × 168 h	A	B
Sulfuric acid (97%)	40°C × 168 h	A	A
Nitric acid (65%)	40°C × 168 h	A	C
Hydrofluoric acid (46%)	40°C × 168 h	A	A
Phosphoric acid (85%)	80°C × 168 h	A	—
Acetic acid	40°C × 168 h	A	D
Hydrogen peroxide water (31%)	RT × 168 h	A	A
Monoethanolamine	80°C × 168 h	A	Dissolved
P G M E A	RT × 168 h	A	D
N-methylpyrrolidone	80°C × 168 h	A	D

Based on immersion test results, A: volume change less than 5%, B: volume change 5 to less than 20%, C: volume change 20 to less than 50%, and D: volume change 50% or more.

Chemical Resistance of FLUORITZ™-SB



The values listed in the table are all actual measured values, not standard values.

ARCURY™ Series

Wet processes, which comprises between 1/5 and 1/3 of the entire semiconductor manufacturing process, have traditionally involved RCA cleaning, which utilizes highly concentrated and high temperature acids, alkaline, and ultrapure water as cleaning chemicals. Due to the rapid development of finer processing technology for semiconductors, the demand for purer cleaning chemicals has increased,

while management of fine particles, metal contaminants, and organic matter from contacting cleaning agents has grown even harsher. In order to respond to these demands VALQUA developed the "ARCURY™" brand of sealant, which boasts superior chemical resistance in wet processing of semiconductors and liquid crystal displays, while also exhibiting superior levels of purity.

Introducing the Products of the ARCURY™ Series

Product Name	ARCURY™-AD	ARCURY™-AL	ARCURY™-SO	ARCURY™-OZT	ARCURY™-OZW	
Characteristics	Possesses superior resistance to acidic solutions and has a high degree of purity due to reduced elution quantities of metals and organic materials.	Has superior resistance to alkaline solutions such as ammonia, which has been difficult to achieve with traditional fluoro-rubbers.	Highly resistant to polar organic solvents such as ketones, esters, and amines.	Possesses superior resistance to ozone gas and ozonated water, and has a high degree of purity due to reduced elution quantities of metals and organic materials.	Highly resistant to ozone gas and ozonated water. Has higher heat resistance compared to OZT.	
Characteristics	Outer Color	Transparent, dark amber	Black	White	Transparent	White
	Hardness (Shore A)	67	75	73	60	68
	Tensile Strength (MPa)	12.0	23.8	9.4	17.0	13.0
	Stretch (%)	190	220	185	580	230
	100% stress (MPa)	3.3	7.5	4.6	1.7	3.4
	Compression set (%)	25* ¹	31* ²	16* ²	48* ²	37* ¹
Primary Uses	I. Wafer, glass substrate cleaning equipment II. Spin coaters, spin developers III. Chemical solution transport container seals IV. Valve seals V. Filter seals VI. Joint seals, etc.		I. Ozone cleaning equipment II. Ozone generators III. Ozone decomposing equipment, etc.			

The values listed in the table are all actual values, and are not standard values.

*1) Compression permanent strain: 200°C x 72 hr, compressibility: 25%, AS568A-214 O-Ring used
*2) Compression permanent strain: 150°C x 72 hr, compressibility: 25%, AS568A-214 O-Ring used



ARCURY™-AD



ARCURY™-AL



ARCURY™-SO



ARCURY™-OZT



ARCURY™-OZW

VALFLON CRYSTAL RUBBER™

VALFLON CRYSTAL RUBBER™ is a new thermoplastic elastomer made using a combination of fluororesin and fluoro rubber. Crystal Rubber is manufactured using VALQUA's proprietary crosslinking technology without the

use of vulcanizing or reinforcing agents, making it a clean, transparent fluoro-elastomer sealant boasting strong chemical resistance.

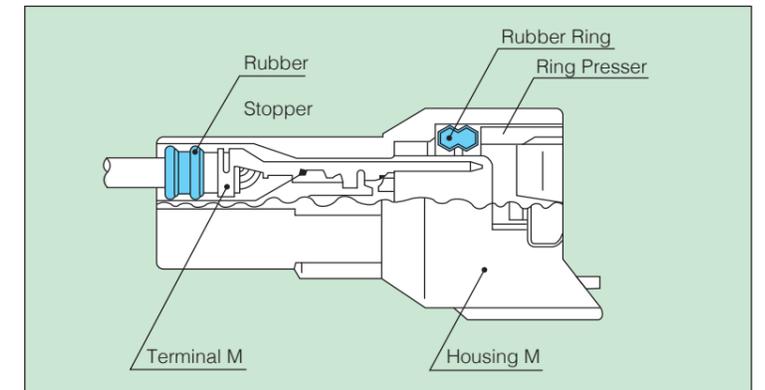
Rubber Products for Harnesses

-Characteristics

This is a rubber material that is non-adhesive with a low friction coefficient, and has had oil forcibly oil bleed onto its surface.

Key Characteristics

- Has superior heat-resistance.
- Has a low compression permanent set.
- Has a low friction coefficient.
- Has low resistance at point of installation.



-Physical Properties

List of Physical Properties of Rubber Seal Components for Harnesses (Bleeding Type)

Rubber Materials	Nitrile Rubber (NBR)				Silicone Rubber (VMQ)		
	40	50	50	50	35	50	
Hardness Hs (JIS A)	40	50	50	50	35	50	
VALQUA Material Symbol	B0540	B0750	B0950	B1250	E0035	E2250	E1750



Other Products



These are metallic and fired products that function as both friction absorbers and seals.



Grommet materials or cylinder gasket heads, diaphragms around actuators, and other heteromorphic molded products.

Other Rubber Materials

We have a wide array of products, including nitrile rubber, acrylic rubber, silicone rubber, ethylene/propylene rubber, fluorinated elastomers like fluorosilicone rubber and crystal rubber, as well as chlorinated elastomers like chloroprene rubber

For example, we have super rubber which is effective against sour gasoline, as well as solvent resistant grade fluoro rubber for gasohol (gasoline mixed with alcohol), and hot water and steam resistant grade fluoro rubber for LLCs.

TOUGHRETHANE™ Products

Injection Molded Products

Used when rubber might tear, or when resin may not have adequate flexibility or elasticity. Includes filler materials with lowered friction coefficients. Can be selected in accordance with intended use.



Film Sheets

Thermoplastic elastomer possesses the greatest degree of mechanical strength, has superior flexibility, abrasion resistance, weather resistance, and oil resistance, and can even retain flexibility under extreme cold temperatures between -20°C and 50°C.

Air bags for use in seats are used to comfortably support drivers over a long period of time.



As equipment, machinery, piping, and the like in the food products industry are regularly disinfected and sterilized, they must not only be able to withstand such regular disinfection and sterilization, but also have no adverse effect on odor, taste, and sensitivity. The components and sealants used for these purposes are expected to meet materials selection and quality management

to satisfy the needs described, and our company has made elastomer products for use with respect to food products out of nitrile rubber, super rubber, silicone rubber, fluoro rubber, ethylene-propylene rubber, and urethane rubber.

Ferrule Gaskets for Clamp Couplings

Characteristics

- ▶ A rubber compound that has met the standards of the Food Sanitation Law.
- ▶ A rubber compound with superior odor and taste sensory qualities.

Material

- ▶ Rubber Material
Standard materials are EPDMs (ethylene-propylene rubber), but if VMQs (silicone rubber) or FKMs (fluoro rubber) are necessary, please contact us separately.



Casing Grip

- TOUGHRETHANE™ E VALQUA No. E9320



Faucet Packing

- TOUGHRETHANE™ E VALQUA No. E9015



PTFE-Coated Gasket

- Synthetic Rubber PTFE-Coated Gasket VALQUA No. 2060 PTB
- Valquon PTFE-Coated Gasket VALQUA No. 5060PTB

Manufacturing in the food and drink market often involves manufacturing a variety of products at once rather than focusing on one product at a time. When manufacturing multiple varieties of products, the smell and taste of the manufactured products seeping in to rubber-based sealants has heretofore been a significant problem, as the lingering smells and tastes could be transferred on to other products, and until recently the problem has had no effective solution. It is now possible to solve this problem by using odorless, PTFE-coated products in areas where the rubber-based sealants come into contact with the products created.



Packing for Rotating Equipment

Wilson Seal

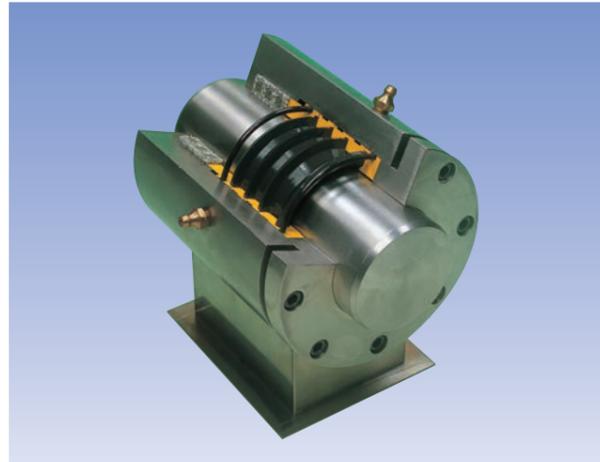
Gland packing, mechanical seals, and oil seals, among other varieties, are usually used as seals for rotating equipment. Wilson seals are composite sealants developed to act as seals for the axes of low-speed/vacuum agitators for which gland seals were insufficient, and, thanks in part to their additional use in absorbing shaft runout, have already seen great success in practical use.

Characteristics

Wilson seals are sealants optimized for use as rotating axis seals for vacuum equipment.

- 1) The pressure is typically 1.33×10^{-4} Pa {10⁻⁶ Torr} to 0.49MPa {5 kgf/cm²} (however, gland packing is also used when pressurizing).
The product can be used with a PV value range of MAX 0.5 MPa · m/S {5 kgf/cm² · m/sec}.
- 2) Optimized for rotating axes with significant axis shaking. (MAX. 2mm)
- 3) The standard material for lipper sealant is fluoro rubber, which can be used up to 120°C. For high temperature specifications (150°C or greater), the product can be used through cooling with accessories like water jackets.
- 4) Cheaper when compared with mechanical seals.
- 5) Requires the use of lubricating grease.

Types include vacuum use, vacuum pressurization use, and pressurization use.



X-Rings

The X-Ring is a nearly square ring packing with an X-shaped cross section, and is effective as a sealant for rotating operations. A variety of synthetic rubbers are available for use as rubber materials, each suitable for particular applications.



Oil Seals

Oil seals have an extremely wide variety of applications, and the rubber materials and shape structures used vary depending on the usage conditions. The lip that comes into contact with the surface of the axis always retains a certain amount of tension force, and oil seals also use garter springs to support operations that come into contact with the axis, and metal rings to both support the packing and to fill the space between the oil seal and the installation slot.



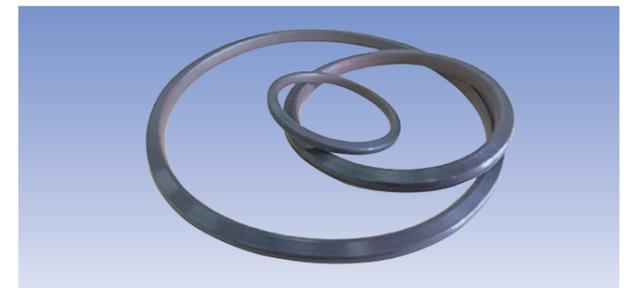
T-Ring

T-Rings can be given the same compact design possible for O-Rings, and in addition to being useable in situations where sliding directions overlap, they can also be used in shaking and low-speed rotation conditions. This seals is comprised of a rubber ring with a T-shaped cross section combined with a backup ring, and is used in a variety of different devices such as swivel joints, accumulators, boosters, and machine tools. Note that this product is used as a seals for our company's cylinder valves (rapid on/off valves), and offers stable performance.



LFR SEAL™

In addition to leak-prevention capabilities, which goes without saying, 6 things are often expected of seals for rotating equipment: (1) compact attachment spaces, (2) reduced running torque, (3) increased pressure resistance, (4) extended lifespan, (5) improved fit, and (6) low cost. However, no seals in the past have managed to satisfy all 6 of these items, and at least one area needed to be compromised. The LFR SEAL™ is an axis seal for rotating equipment that satisfies all six of these characteristics at once.



Axis Seals for Rotating Products

<Comparison Chart>

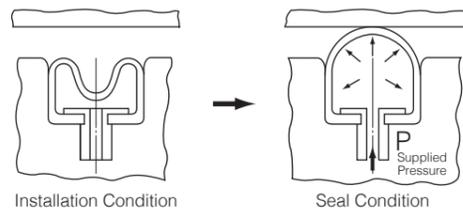
Item	Type	Wilson Seal	X-Ring	T-Ring	D-Ring	LFR SEAL™
Form						
Characteristics		<ul style="list-style-type: none"> - Lipper packing. - A seal kit product that can provide vacuum and pressurized sealing. - Optimized for rotating axes with significant axis swaying. (MAX.2 mm) 	<ul style="list-style-type: none"> - Squeeze packing. - A One-Ring product that can provide vacuum and pressurized sealing. - Neither rolls nor twists. - Can provide high-pressure sealing if used in conjunction with backup rings. 	<ul style="list-style-type: none"> - Squeeze packing used jointly with a backup ring. - A product that can provide vacuum and pressurized sealing. - Neither rolls nor twists. - Can provide sealing for intense vacuums and high pressures. 	<ul style="list-style-type: none"> - Squeeze packing. - A One-Ring product for pressurized sealing. - Neither rolls nor twists. - Shaped to prevent extrusion into gaps. 	<ul style="list-style-type: none"> - A Slipper Seal type rotating axis seal that is adaptable to JIS-standard O-Ring grooves. - Low sliding force sealant to which PTFE was simultaneously molded on the sliding surface.
Sealing Capabilities		Up to 10 ⁻⁶ Torr to 0.49 MPa (5 kgf/cm ²).	Up to low vacuum – 4.9 MPa (50 kgf/cm ²).	Up to 10 ⁻⁶ Torr to 68.6 MPa (700 kgf/cm ²).	Up to MAX of 11.8 MPa (120 kgf/cm ²).	Up to 14 MPa.
Maintenance		Grease must be replenished once every 3 months.	Not necessary.	Not necessary.	Not necessary.	Not necessary.
Special Items (Precautions)		Lubrication necessary as a rubber lipper is used.	Lubrication necessary.	Lubrication necessary.	Lubrication necessary.	Lubrication necessary.
Cost (Lowest to Highest)		4 (However, replacement with just rubber components is possible from 2nd time onward)	2	3	1	3

Other Rubber Products

INFLATE SEAL™

INFLATE SEAL™ is a product based on new ideas, and can retain sealing capabilities for long periods of time regardless of whether the contained materials are gases, liquids, or powders, and even if the surfaces that need sealing, for example, on doors that need to be airtight, are modestly distorted, deformed, or uneven.

This product is a hollow gasket made of rubber containing reinforcing fabrics or just rubber by itself, is formed in a variety of shapes, such as circular shapes, frame shapes, straight pipes, and U-shaped pipes, depending on the usage purposes and conditions, and is constructed to exhibit its sealing capabilities through expansion by supply air, etc. into the center hollow.



(Note) As a general matter, this product is not suitable for use in sliding sections, and has seen wide-spread delivery as gaskets in a variety of cross-sectional shapes.

Diaphragm

Diaphragms, which are frequently used in control valves in automation equipment, fuel pumps, and other types of valves, are high-performance membranes that utilize the flex resistance, weather resistance, and gas permeability resistance characteristics of materials such as chloroprene rubber, nitrile rubber, fluoro rubber, and silicone rubber, depending on the intended use of the diaphragm. In order to improve pressure resistance in diaphragms, they are usually reinforced with fabrics like nylon while also being used in conjunction with elastomers.



L.J. U-Packing

This packing sees broad use as seals for rods and pistons in various types of cylinders, as well as for other reciprocating sliding sections. Available in cloth-filled rubber products for mid to high pressure uses, as well as synthetic rubber-only products for low pressure uses.



Specialized Fluoro Rubber

Heat Resistant Fluoro Rubber (D2570)

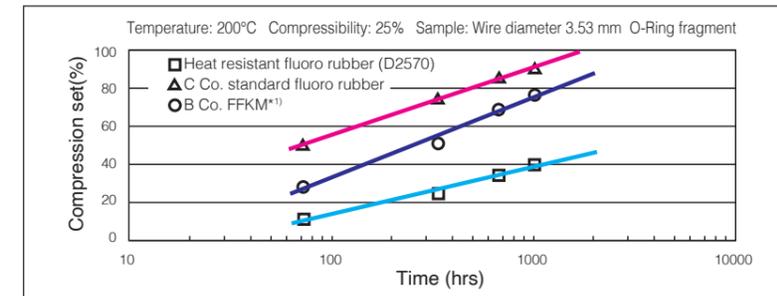
Elastomer sealants experience significant permanent sets over time when used in heated atmospheres, thereby reducing the reliability of their sealing performance. Therefore, even fluoro rubber, known for its superior heat resistance, has a limited lifespan as a sealant when used in high temperature environments. Compared with past, general-use fluoro rubber seal products, D2570 has a significantly improved compression set characteristic, and an extended lifespan as a seal, thereby making a product requiring even fewer maintenance cycles.

Physical properties of heat resistant fluoro rubber (D2570)

ITEM	UNIT	Heat Resistant Fluoro Rubber(D2570)
Outer color	—	Black
Hardness	Shore A	72
Tensile Strength	MPa	13.6
Stretch	%	230
100% Modulus	MPa	3.2

The values listed in the table are all actual values, and are not standard values.

Compression set characteristics of heat resistant fluoro rubber (D2570)



The values listed in the table are all actual values, and are not standard values.
*1) FFKM refers to perfluoroelastomers.

Solvent Resistant Fluoro Rubber (D2670)

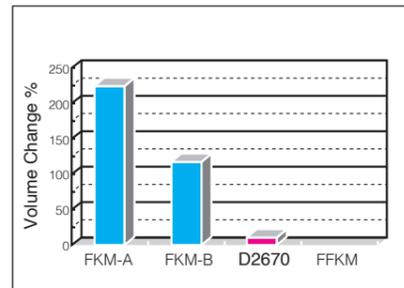
When immersed in solvents, elastomers tend to swell and dissolve, thereby possibly reducing its sealing capabilities. D2670, in addition to being a fluoro rubber with chemical resistance comparable to perfluoroelastomers, is also a particularly low-cost elastomer sealant. It is also a clean material with few effluents, and can be used in fields like food product and semiconductor production.

Physical properties of solvent resistant fluoro rubber (D2670)

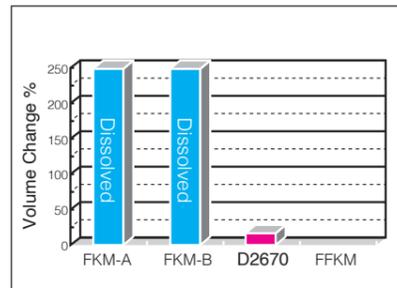
ITEM	UNIT	Solvent-Resistant Fluoro Rubber(D2670)
Outer color	—	Black
Hardness	Shore A	73
Tensile Strength	MPa	7.8
Stretch	%	220
100% Modulus	MPa	3.4

The values listed in the table are all actual values, and are not standard values.

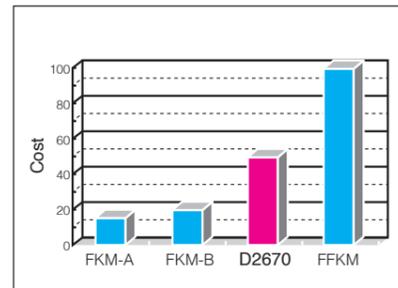
Acetone immersion test (RT x 72 hrs)



Butylamine immersion test (RT x 72 hrs)



Product price comparison



Characteristic chart

ITEM	D2670	FKM-A (General Use)	FKM-B (Solvent Resistant)	FFKM
Acid resistance	○	○	○	○
Alkali resistance	○	×	○	○
Ketone resistance	○	×	×	○
Ether resistance	○	×	○	○
Amine resistance	○	×	×	○
Included metals	○	×	○	△
Low temperature capability	○	△	×	×
Cost	△	○	△	×
Moving uses	×	○	△	△

TOUGHRETHANE™ is the collective name given to VALQUA's urethane elastomers, and include general molded forms, films, sheets, tubes and ropes manufactured through injection, extrusion, compression, and cast molding methods.

In addition to high degrees of strength, abrasion resistance, and oil resistance, among other qualities, these products also exhibit superior weather resistance and hydrolysis resistance, and see a broad variety of applications, such as use in vehicles, construction equipment, hydraulic and pneumatic equipment, as well as components for industrial machinery, semiconductor manufacturing equipment, medical equipment, household electronics components, housing and facility equipment, and sports products.

General Molded Products

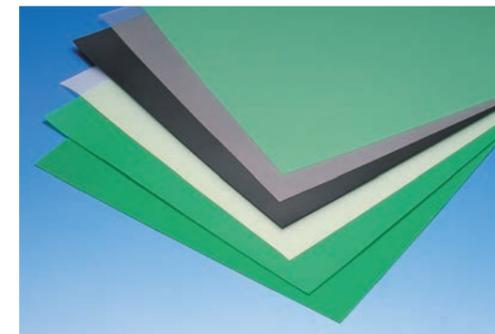


Injection Molded Products



Various Rollers

TOUGHRETHANE™ materials and processed goods



Films, Sheets



Printing Sheets (embossed products)



Film Fusion Processed Goods (band airbags) (large-type)



Tubes, Ropes

Elastomer Materials List

Rubber Materials	VALQUA Material Symbol	Characteristics and Uses	PRODUCTS	(d) Working Temperature Scope (Reference) °C	Hardness durometer A	Tensile Strength MPa	Stretch %	(b) Compression permanent set %	Applicable standards	Series Material Code	
Nitrile Rubber (NBR)	B0040	Mineral oil	O-Ring	-50 – +100	40	14.4	710	27 ²⁾	MIL-R-6855DCLASS1		
	B0150	Mineral oil		-35 – +120	50	13.4	670	17 ²⁾			
	B0250	Mineral oil, animal and plant Oil	Diaphragm	-20 – +120	53	15.8	660	84 ²⁾			
	B0350	Animal and plant oil, water	General Molded Products		50	8.6	440	25 ²⁾	Notice of the Ministry	B0680 B0290	
	B0750	Oil bleeding	Various Seals	-45 – +120	51	13.8	710	45 ³⁾		B0950	
	B0060	Mineral oil	General Molded Products	-20 – +120	62	15.1	400	22 ²⁾		B0070 B0080	
	B0160	Mineral oil	O-Ring	-30 – +100	60	25.3	560	14 ²⁾			
	B0170	Fuel oil		-30 – +120	70	16.9	340	10 ²⁾	JIS B2401 Class 2		
	B0570	Mineral oil		-35 – +120	70	16.5	320	20 ³⁾	JIS B24011 Class A Notice of the Ministry of Health and Welfare No. 201 (a)		
	B1370	For low temperatures		-50 – +120	70	14.5	190	9 ²⁾			
	B2070	Highly fragrant gasoline		70	14.5	370	13 ²⁾				
	B2270	For Vacuums		-20 – +120	73	18.1	370	15 ²⁾			
	B2670	Abrasion resistance for pneumatics		Oilless packing TOUGHRILE	72	18.0	270	12 ²⁾			
	B2770	For high temperature oils		O-Ring	-40 – +135	70	17.0	310	15 ³⁾		B0880 B0385 B0690
	B0675	Heat resistance, friction resistance		O-Ring, Various Seals	78	19.8	220	9 ²⁾			
	B0180	Mineral Oil For pneumatics		O-Ring, Mini U-Packing	-20 – +120	83	21.0	240	14 ²⁾		
	B0780	For pneumatics	U-Packing, dust seal Cushion Packing	82	20.2	200	16 ²⁾				
	B0390	Hydraulics	O-Ring, U-Packing, Dust Seal V-Packing	-35 – +120	88	19.2	160	16 ³⁾	JIS B24011 Class B JIS B2403 Notice of the Ministry of Health and Welfare No. 201 (a)		
B0490	For low temperatures	O-Ring, U-Packing V-Packing	-50 – +100	88	15.6	150	21 ³⁾	MIL-P-5510B			
Lubricating rubber	B5075	Lubricated, non-adhesive	O-Ring, Various Seals	-25 – +150	75	19.0	290	15 ³⁾	Notice of the Ministry of Health and Welfare No. 201 (a) JIS K6353		
Super Rubber (HNBR)	B5070	Heat resistance, friction resistance	O-Ring, Various Seals	-30 – +150	73	30.3	300	10 ³⁾	Notice of the Ministry of Health and Welfare No. 201 (a)	B5060 B5080	
	B5680	CFC resistance R134a)	O-Ring, Various Seals	-25 – +150	81	22.8	220	11 ³⁾		B5485	
	B5290	Hot water resistance, friction resistance		-30 – +150	91	26.2	150	13 ³⁾	Notice of the Ministry of Health and Welfare No. 201 (a)	B5160 B5170 B5180	
	B5490	For white		-35 – +150	88	27.1	290	28 ⁴⁾			

Note) (a) Please provide instructions indicating if an order is for an intended food product use. (b) Conditions of compression permanent set tests are as follows. 1) 70°C – 22 h, 2) 100°C – 70 h, 3) 120°C – 70 h, 4) 150°C – 70 h, 5) 150°C – 22 h, 6) 175°C – 22 h, 7) 175°C – 70 h, 8) 80°C – 70 h, 9) 204°C – 70 h

Rubber Materials	VALQUA Material Symbol	Characteristics and Uses	PRODUCTS	(d) Working Temperature Scope (Reference) °C	Hardness durometer A	Tensile Strength MPa	Stretch %	(b) Compression permanent set %	Applicable standards	Series Material Code
Fluoro Rubber (FKM)	D0070	Heat resistance, oil resistance, chemical resistance	Gasket Diaphragm	-15 – +200	72	14.6	370	22 ⁶⁾		D0060 D0080
	D2270	Electrical conductivity, high strength	O-Ring, belt	-10 – +200	71	29.4	420	13 ⁶⁾		
	D0270	Low compression permanent set For vacuums	O-Ring	-15 – +200	72	13.9	260	4 ⁶⁾	JIS B2401 Class 4 D Notice of the Ministry of Health and Welfare No. 201 (a)	D0260 D0280 D0290
	D2470	Acid resistance		-20 – +200	70	18.7	430	30 ⁷⁾		
	D2570	For high temperatures Low compression permanent set		-15 – +230	72	13.6	230	3.8 ⁶⁾		
	D2670	Solvent resistance		-50 – +200	73	7.8	220	7 ⁷⁾		
	D2770	General-Use		-15 – +200	73	14.1	250	13 ⁶⁾		
	D0970	Alkali resistance		0 – +200	70	17.6	270	23 ⁶⁾	Notice of the Ministry of Health and Welfare No. 201 (a)	
	D1270	Solvent-resistance		-15 – +200	70	15.3	320	18 ⁷⁾	JIS B2401 Class 4 D Equivalent	D0880
	D9070	Color (Brown)		-15 – +200	71	13.1	220	4 ⁶⁾		
	D0675	Steam resistance Low compression permanent set		0 – +200	75	18.6	160	15 ⁶⁾		
	D0875	For low temperatures		-30 – +200	78	18.6	190	–		D1490
	D0390	Low compression permanent set High strength	Various Seals	-15 – +200	90	17.6	170	14 ⁶⁾		D0360 D0370 D0380
	D0890	Steam resistance	O-Ring	0 – +200	89	18.0	260	32 ⁶⁾		
	D9270	Anti-staining properties (white)		-10 – +200	72	15.0	270	16 ⁶⁾	Notice of the Ministry of Health and Welfare No. 201 (a)	
	D9160	For transparent, non-polluting semiconductors		-10 – +150	61	13.6	500	36 ⁵⁾		
	FLUORITZ™-SB	Highly superior chemical resistance		0 – +200	77	17.9	160	–		
	FLUORITZ™-TR	Highly superior crack resistance	0 – +260	72	11.1	160	–			
FLUORITZ™-HS	Highly Superior Heat Resistance	0 – +300	77	20.0	160	–				
(C) TOUGHRETHANE™ (AU, EU)	R0090	Heat resistance	Various Seals	-30 – +100	87	32.8	310	17 ²⁾		R0060 R0070 R0080
	R0490	High performance	TOUGHRETHANE P Long-Lasting Seal	-20 – +80	93	43.0	360	28 ⁸⁾		R0595
	R5190	General-Use	Ball, Coupling	-25 – +80	90	44.0	550	40 ¹⁾		R5180 R5185 R5195 R5198
	R5390	Water resistance	Various Seals, Films	-30 – +80	90	39.2	500	35 ¹⁾		R5380 R5385 R5395
	R5590	Oil resistance	Hydraulic Packing		90	44.0	500	40 ⁸⁾		R5585 R5595 R5598
	R5795	Transparency	Printing sheets	-20 – +80	95	44.0	450	40 ¹⁾		
R6195	Hydrolysis resistance	TOUGHRETHANE New Series Hydraulic Packing	94		51.0	400	28 ⁸⁾		R6190	
R6395	Low compression permanent set	Various Seals General Molded Products	-30 – +100		95	39.2	540	23 ⁸⁾		R6390

Note) (c) TOUGHRETHANE™, a trademark of VALQUA, is a urethane rubber product produced and sold by VALQUA. (d) The working temperature scope will change based on usage conditions and demanded capabilities, such as the nature of flowing materials and pressure involved. Please contact us for details.

Note) The physical characteristics values are all examples of measured values at room temperature, and are not standard values.

