Manual for Seal Selection

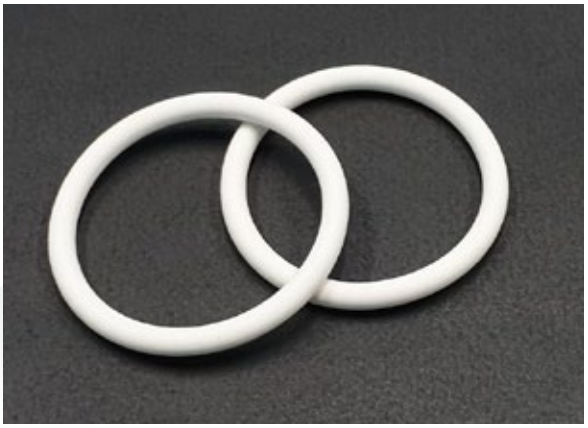
Katon®

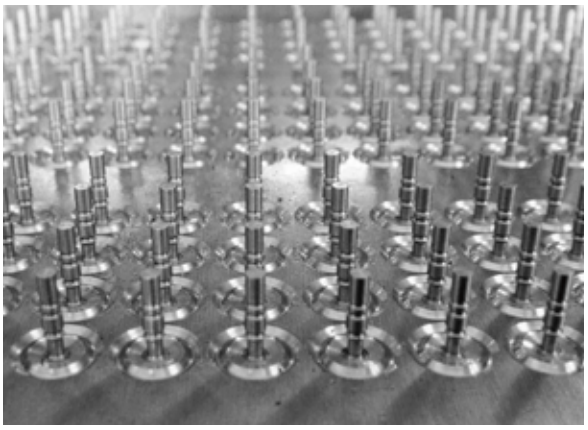
About Us

KATON® is brand of Maxmold® FKM and FFKM fluoroelastomer.

Maxmold® is a professional manufacturer of FKM fluoroelastomer with a history of thirty years, which supply high-quality sealing elements at reasonable prices, and produce all sizes of fluoroelastomer sealing elements in large or small batches. Learn more about OEM, MOR, ODM and distribution agent, and more professional services!

The manual will help you to choose the suitable and optimal fluoroelastomer.





Our Services

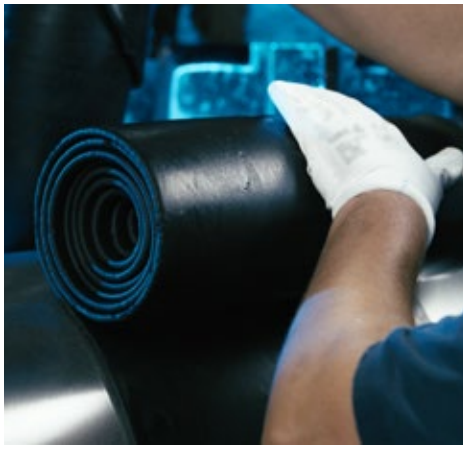
KATON® offers one-stop service from discussion, design, mold opening, sampling, alteration and volume production.

- Recommendation on groove design
- Recommendation on chemical and mechanical limits
- The optimal formula
- Recommendation on mold design
- Main points of installation
- Technology of formula verification

Quality Assurance

Quality is the most important commitment to customers and the requirement of self-management. In order to perform the marketing strategies effectively, KATON® establishes the rigorous quality control, which is our commitment to customers and the tenet that all employees follow.

We strictly control quality of raw materials through raw material test and identification, specific checks of equipment and acceptance standard. We ensure the size and surface quality of seals and physical characters under ISO and ASTM standards throughout the production process, sampling, test and check of the final products.



BellCERT ISO 9001

ASTM INTERNATIONAL

DUN & BRADSTREET D-U-N-S® REGISTERED

CSR Corporate Social Responsibility

The Earth gives us many benefits and present prospects, we cherish the valuable resources of the Earth so that the next generation can enjoy such great environment, and make contributions to the society together with our customers. We undertake our social responsibilities, respect human interaction, maintain all internationally recognized human rights, and provide our partners the safest, diversified and fair work environment.

Content

1 Application of rubber polymers

The rubber industry is an integral part of our daily life and has wide application from automobiles, consumer electronic products, medical industry to air transportation, etc.

Petroleum and Chemistry

Application Environment

- Gas and mineral exploration
- Petroleum production equipment
- General machinery
- Chemical injection equipment

Considerations

- Chemical tolerance of gas and liquid
- Volume swell and physical property change
- Explosive deformation
- Better compressive deformation capacity
- Wide temperature range
- Making special specifications

Engineering Machinery

Application Environment

- Rotating equipment, pump and compression
- Oil injection equipment
- High-temperature high-pressure equipment
- Vacuum machinery
- Chemical injection equipment

Considerations

- High precision and use under low clearance
- Chemical tolerance of gas and liquid
- Better compressive deformation capacity
- Oil permeability
- Strict tolerance
- Operating environment

Transportation

Application Environment

- Automotive engine systems
- Lubricating systems
- Fuel systems
- Drive systems

Considerations

- Volume swell and physical property change
- Gear oil, transmission oil and engine oil
- Properties under different working temperatures
- Oil chemical resistance
- Valve rod and rotating shaft
- Permeability resistance

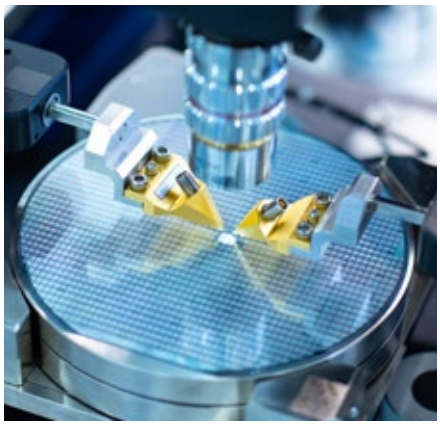
Semiconductor, Flat-Panel Display and Optoelectronic Industry

Application Environment

- Equipment in clean room
- Chemicals conveyors
- Facility support equipment
- Pumps, valves and pipes
- Water filtration equipment

Considerations

- Mostly used low-release FKM
- Reach to -3mm Torr high vacuum
- Groove design for low overflow of gas
- Special acids and plasma
- High-flow O2 and O3



Food, Beverage and Dairy Industry

Application Environment

- Low release of pollutants
- Easy repair
- Easy maintenance
- Boiler and steam

Considerations

- Stability under different working temperatures
- FDA, VI and 3A standards
- Solid material conveying system
- Liquid material conveying system
- Steam tolerance

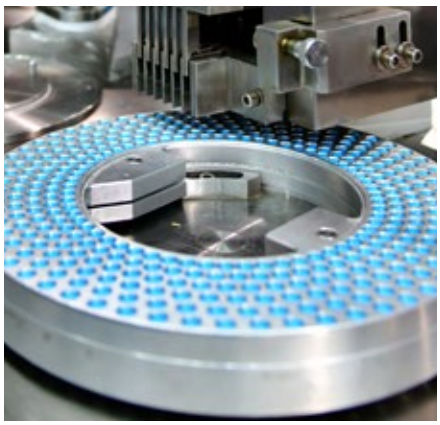
Biotechnology

Application Environment

- Production and packaging in clean room
- Sanitary gasket
- Butterfly valve seat
- Inflation of ball valve

Considerations

- Process downtime, sealing life
- Corrosivity clean and sterilization process
- Withstand all kinds of media
- Active drug ingredients
- Stability under high temperature



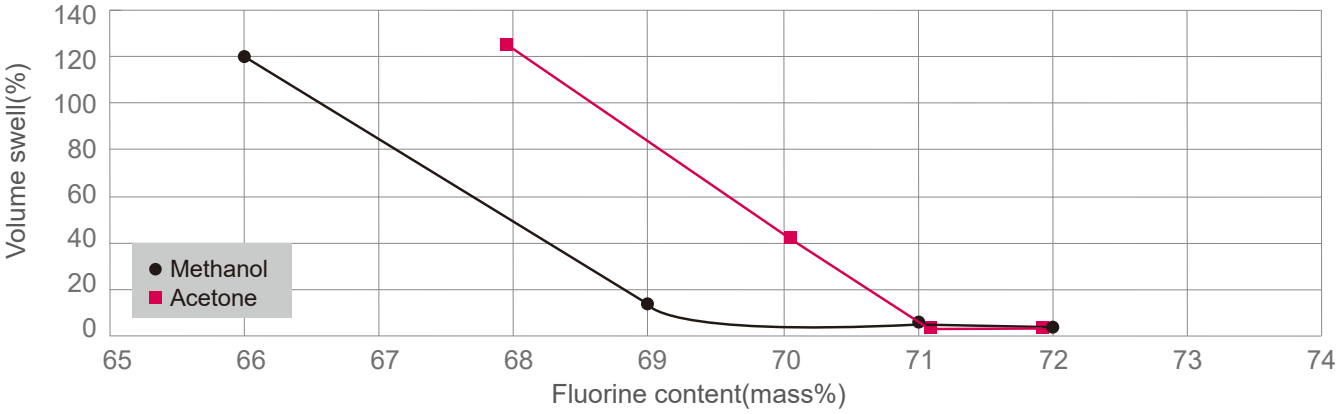
2 FKM Selection

The first step of selecting suitable sealing elements is to consider types of chemicals and working temperature that elements may suffer, the following analysis will help you learn more about the suitable seal and fluoroelastomer.

Sealing elements for chemical processing industry

To classify KATON® sealing elements by SAE J200/ASTM D2000 standard, FKM fluoroelastomer is classified to HK (H= specific heat resistance to ≧250℃, K= the specific chemical inertness of IRM903 oils under the temperature of 150℃), some classifications related to special fluoroelastomer can be found out in the HK classification system.

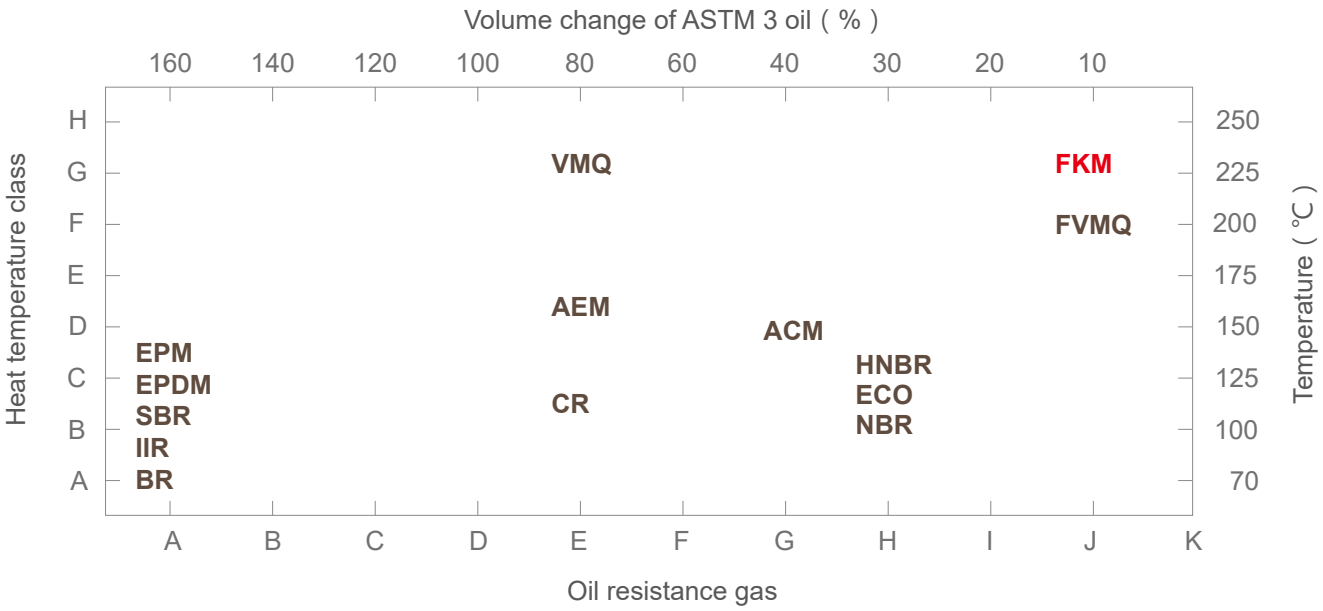
Relation of fluorine with resistance to methanol and acetone Testing condition：70hrs@40℃



Comparison of sealing elements for petroleum and natural gas industry

KATON® provides high-pressure fluoroelastomer for the petroleum and natural gas industry. Combined with rapid gas decompression (AED), high-performance sealing elements applied in the industry providing the best chemical resistance products for acid gas and liquid. The products are tested and approved by Norsok M-710 standards.

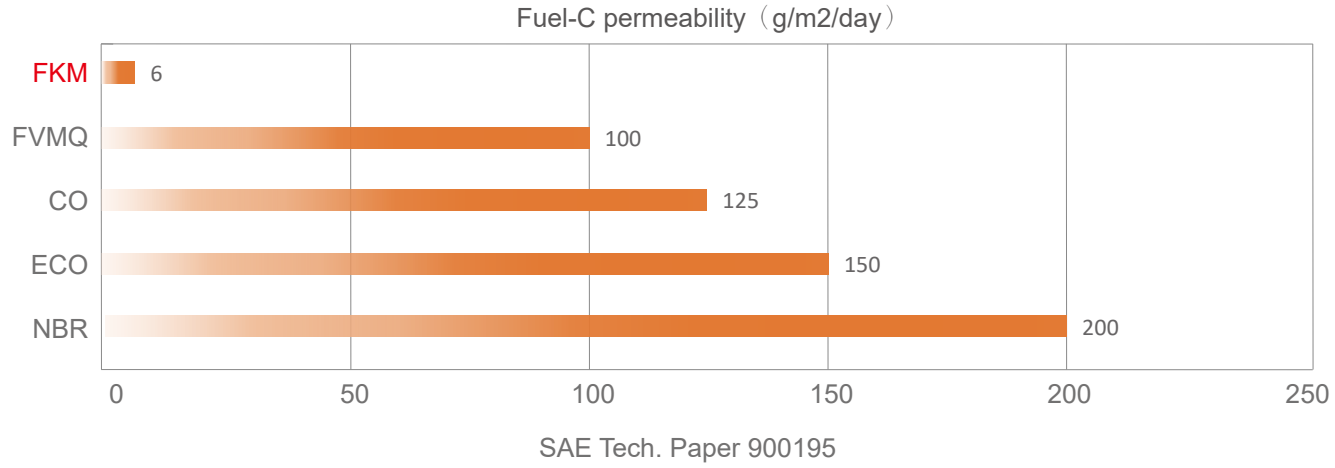
Relation of temperature with ASTM 3 oil



Resistance to fuel permeability

Seals resistant to fuel permeability and corrosion are very important to protect operators and environment. KATON® FKM and FFKM sealing elements show great performance even under the environment of volatile chemical processing, which can reduce maintenance cost and downtime of equipment, and ensure the durability of equipment.

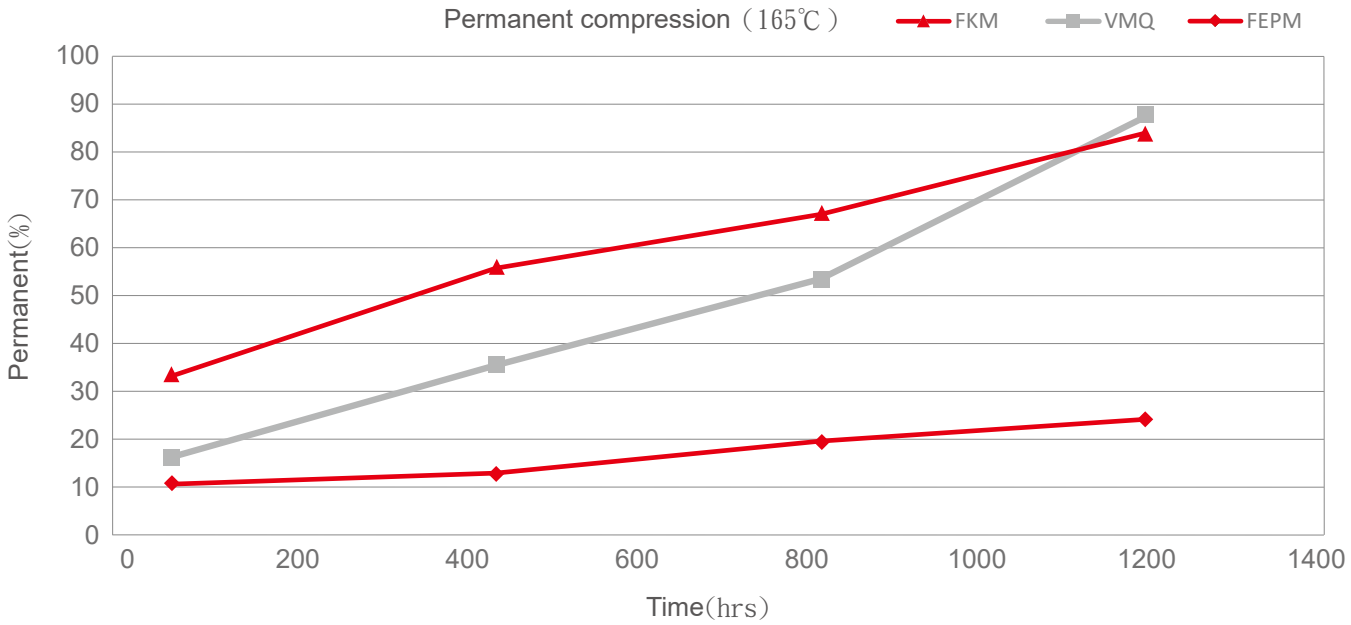
Fuel permeability resistance of different rubbers



Resistance to high-temperature steam

KATON® FKM and FFKM fluoroelastomers are frequently used in high-pressure cleaning (CIP) equipment. CIP/SIP systems are designed to food cleaning and sterilization of beverage and dairy industry. We conform to FDA and provide reliable solutions for customers.

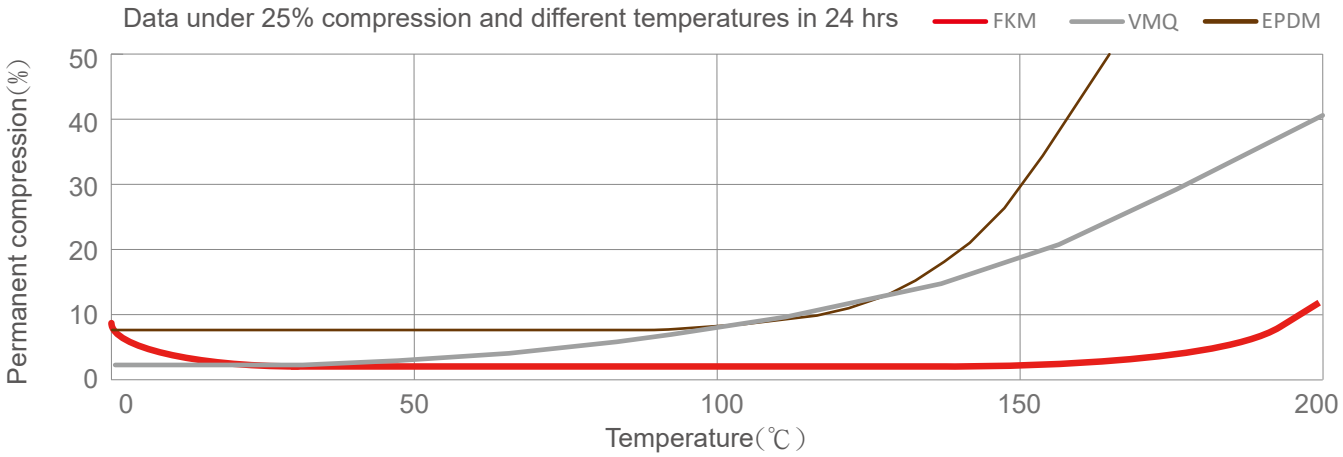
Steam resistance



Resistance to physical and mechanical properties

Permanent compression set of rubber is related to resilience of vulcanized rubber, and the rate is decided by resilience of rubber structural change or destruction, intermolecular shift and so on.The lower the compression, the better the resilience, and the stronger compression resistance.

Permanent compression of different rubbers



Resistance to gas permeability

Resistance of fluoroelastomer to gas permeability differs in material type, hardness, compression set, lubrication, section size, pressure and temperature of sealing gas. Generally harder fluoroelastomer containing more carbon black shows lower diffusion rate, compressed seal can reduce gas permeability.

Gas permeability comparison

Type	Temperature(℃)	CO_2	O_2	N_2
FKM	26	93	88	59
Silicon rubber	26	25740	6829	2955
Butyl rubber	26	919	368	—
Polyurethane rubber	29	2627	315	—
CSM	30	1097	217	—

Gas permeability coefficient of different rubbers（cm^3 mm/24h.m^2.atm）

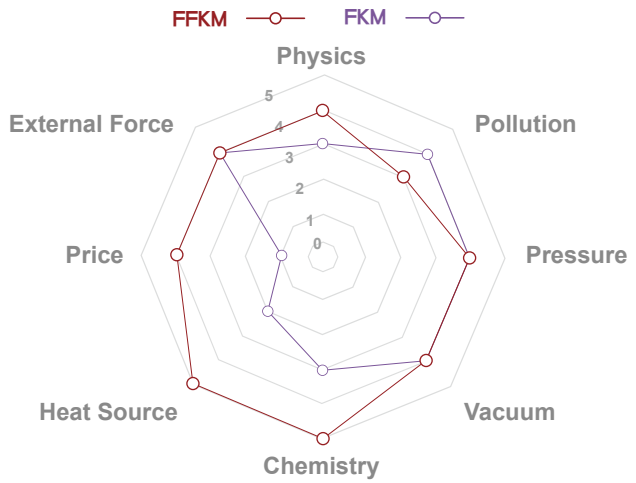
3 Fluoroelastomer Comparison

Katon® can assist you in locating the most effective and appropriate elastomer seals. According to the following comparison table, you can decide what kind of fluoroelastomer materials you require.

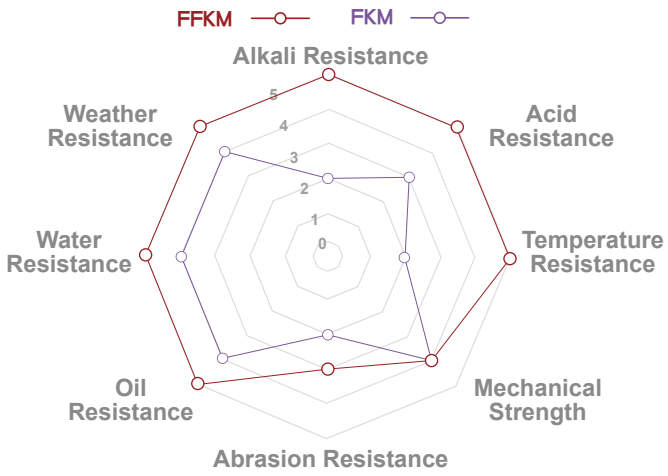
FFKM & FKM Comparison

FFKM contains more fluorine than FKM, it is more resistant to chemical corrosion and temperature changes. Its high temperature-resistant working environment can withstand up to 318℃ according to different models. Relatively speaking, The price of FFKM is higher than FKM. Therefore, FFKM will be your best choice if it needs to be used in a harsh special working environment. In addition, considering the swelling, melting and incompatibility of gaseous alkali metals in fluorinated solvents, the risk of fast failure caused by selecting the wrong grade FKM can be avoided.

Comprehensive Comparison of Physical Characteristics



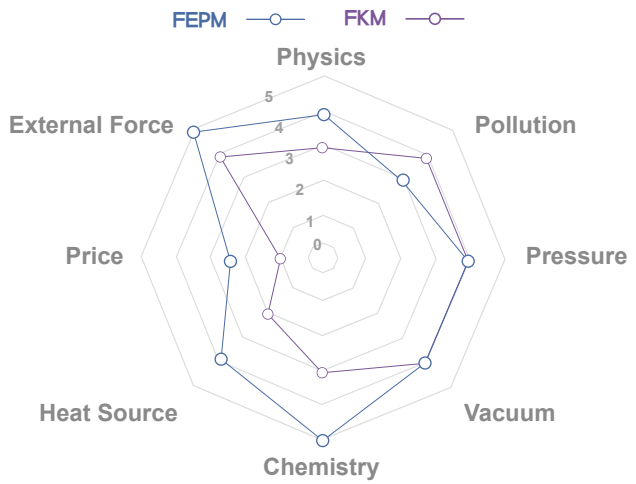
Chemical Resistance Comparison



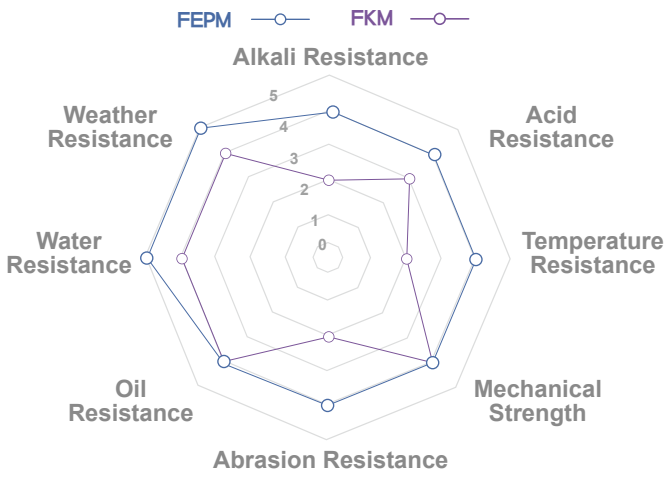
FEPM & FKM Comparison

Especially for ammonia, alkali, and steam, FEPM has superior chemical and heat resistance to FKM. Electrical insulation and heat resistance are both features of FEPM. The highest peak exposure temperature is 250℃, and the constant operating temperature is 200℃. It has good compression resistance at high temperature, but FKM has better performance at low temperature and gasoline resistance. Therefore, FEPM can be used in the working conditions that FKM can't use, and its price is higher than FKM's and lower than FFKM's, so it is a low-cost and high-benefit choice.

Comprehensive Comparison of Physical Characteristics



Chemical Resistance Comparison



	FKM	TPF
Type	Fluoroelastomer has excellent heat resistance, which makes the seal of Fluoroelastomer bear the temperature higher than 200℃. The special resistance of fluoroelastomer to high pressure, chemicals and other fluids (including various fuels).Good oil resistance and corrosion resistance, as well as the excellent resistance to organic solvents, acids, and antioxidants. Its air tightness, weather resistance, flame resistance, radiation resistance, and vacuum performance are also better than those of NBR, silicone, and other elastomers. Combine the characteristics of elastomer and plastic.	Traditional, highly-polluting mineral fillers such as soot, minerals, $BaSO_4$, TiO_2, SiO_2, alumina, and aluminum silicate are not required. Although mineral fillers have a high plasma resistance, when the polymer is plasma etched, discrete particles are left behind, which causes pollution. Since thermoplastic elastomer etching rates are comparable, polymers and filler compounds can be completely etched to produce volatile components, significantly lowering the likelihood of particle generation.Specially design for semi-conductor industry.
Material Cost	**$**	**$$$**
Temp. Range	**-40°C ~ 230°C**	**-10°C ~ 200°C**
High Temp. Resistance	★★★	★
Ketone Solvent Resistance	★	★
Ether Solvent Resistance	★	★
Amine Resistant	★	★
Ozone Tolerance	★	★★★★
Plasma Acceptance	★	★★★★
Steam Resistance	★	★★★
CF4 Resistance	★	★★
NF3 Resistance	★	★★
Features	• Good mechanical performance, and improved sealing performance through compression. • Applicable to explosion decompression, CIP, SIP and FDA. • More resistant to combustion than non-fluorinated hydrocarbons.	• Extremely low release • Low friction • Ozone • Plasma
Weakness	• Cannot be used with molten or gaseous alkali metals. • It will swell significantly in fluorine-containing solvent. • The cost is higher than other non-fluorinated hydrocarbons.	• High temperature resistance is not as good as FKM. • It will swell significantly in acetone.
Industrial Application	• Oil and natural gas • Heavy machinery • Aerospace industry • Automobile industry • Chemical industry • Semiconductor industry • Vacuum industry • Biomedical industry • Machinery	• Plasma ashing equipment • Plasma CVD equipment • Wafer process • Dry etching • Reactive tank

FEPM	FFKM
FEPM is a copolymer of tetrafluoroethylene and propylene, which has a unique monomer structure. Has better electrical resistance and different chemical resistance, and can resist various chemical combinations, Especially, the parts that come into contact with antirust agents containing amine chemicals and lubricating oil for automobiles are frequently used, which is an advantage that general vinylidene fluoroelastomer does not have. It has the same chemical resistance and steam resistance as perfluoroelastomer, and can greatly reduce the cost.	Perfluoroelastomer combines the chemical resistance of PTFE with the flexibility and elasticity of conventional FKM, and is widely used in industry.With a fluorine content of 72%, it has temperature resistance and higher rated temperature, and can withstand the environment where oxygen plasma exists for several hours, up to 318℃. The chemical resistance of perfluoroelastomer can withstand the attack of various chemical products such as strong acids, strong bases, ether, ketone, ester alcohol, aldehyde, nitrogen-containing compound, hydrocarbon, oil, steam, amine compound, etc.
$$	**$$$$**
-10°C ~ 250°C	**-10°C ~ 318°C**
★★★	★★★★
★★★	★★★★
★★★	★★★★
★★★★	★★★★
★★	★★★★
★★★	★★★★
★★★★	★★★★
★★★	★★★★
★★★	★★★★
• Excellent resistance to corrosive chemicals. • Excellent durability to acid, alkali and amine corrosive liquid medicine. • Low outgassing under high temperature steam and vacuum. • Good compression deformation rate.	• Resistance to acid, alkali and temperature is superior to other materials. • Self-extinguishing in air and nonflammable. • Low equipment maintenance cost • The highest fluorine content. • High-density
• Can't work in high temperature for a long time. • Limited tolerance to mineral oil • There are many restrictions in low temperature applications.	• Unit price is higher than other types • Fewer manufacturers
• Automobile gearbox • Aviation industry • Refinery plant • Pharmaceutical factory • Semiconductor • Application under well • Heat exchanger	• Mechanical shaft seal industry • Semiconductor industry • Panel industry • Chemical industry • Electronic industry • Oil and natural gas • Automobile industry • Life medicine • Medical instruments • Aerospace industry

※Performance under the corresponding conditions: ★★★★-Best ★★★-Excellent ★★-Good ★-Bad
※Material price: $$$$-Super-high $$$-High $$-Medium $-Low

4 Fluoroelastomer Technology

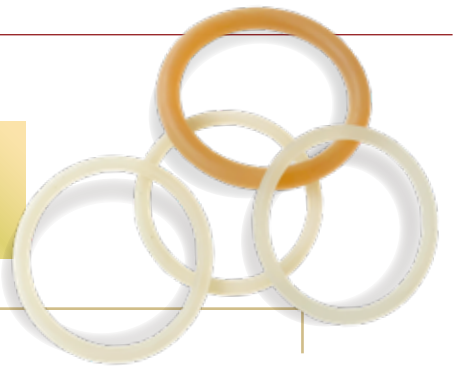
The complete line of Katon® fluoroelastomers can fully meet the needs of different industrial applications. Customers are advised to first conduct an experimental evaluation of the particular application environment depending on the particular environment. We place a high value on the prior safety assessment and technology selection. The choices below are split into two series.

Traditional Technology

Traditional Metal Filler Series

FKM	FEPM-E	FFKM
FK1 Standard fluoroelastomer	PF80E Optimized alkali-resistant and steam-resistant fluoroelastomer	PF325 Chemical-resistant perfluoroelastomer
FK2 Standard tri-fluoroelastomer		PF326 Chemical-resistant perfluoroelastomer
FK3 Cold and chemical resistant fluoroelastomer		PF586 High Temperature perfluoroelastomer
		PF587 High Temperature perfluoroelastomer

Exclusive Patent Technology



Polymer Filler Technology

FKM	TPF	FEPM-P	FFKM
High cleanliness fluoroelastomer	High cleanliness thermoplastic	High cleanliness specfluoroelastomer	High cleanliness perfluoroelastomer

This product is a high cleanliness series, and its low outgassing is superior to that of traditional metal filler series. Its chemical resistance and temperature parameters are the same as those of traditional metal filler series.

5 Traditional Metal Filler Technology

Suitable industries:

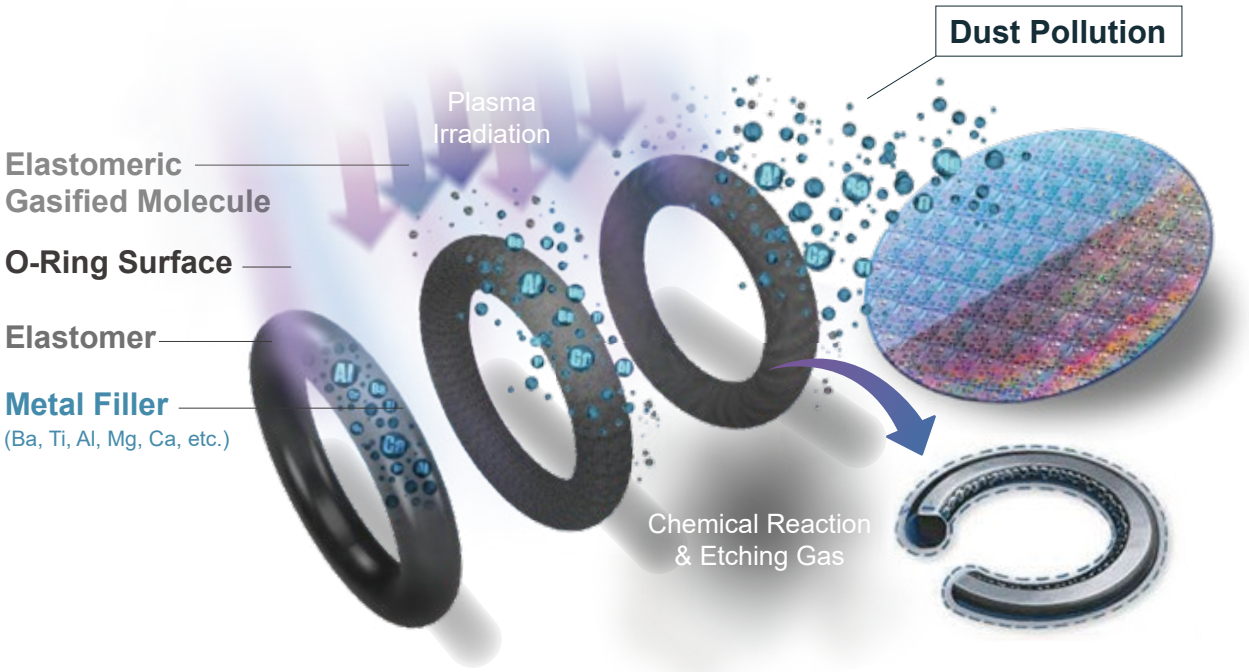
Petroleum and chemistry, machinery industry, electronics industry, transportation, vacuum industry.

Traditional Metal Filler

It is widely used in various industries, with low cost and strong processability, and has excellent performance in organic solvent and chemical environment. Fillers such as carbon, barium, titanium, aluminum, magnesium, calcium, zinc, etc. are added, and when exposed to plasma, ozone, chemical solvent environment and plasma irradiation, the filler outgassing will happen. The outgassing may adsorb the existing volatile matter of the seal or the released metal filler, and degrade the small molecule pollution process.

Traditional Metal Filler Outgassing Process

The seal is eroded by plasma or chemicals, and the filler is released after etching, leaving filler particles to form pollution. Most of the factors are caused by the pressure and temperature of the seal in a high vacuum environment or the selection of incorrect materials. As can be seen from the following process, if your environment is a low-pollution process, the traditional metal filler is relatively unsuitable.



The right fluoroelastomer to avoid seal failure

Fewer accidents when safety measures are done well

Using the wrong seal will lead to sealing failures such as seal rupture, erosion, deformation, and hardening, which may cause safety accidents such as gas leakage and liquid leakage. Therefore, to ensure the normal operation of machinery and equipment and the safety of staff and environment, it is necessary to use correct fluoroelastomer seals, which can also reduce the cost of equipment maintenance.

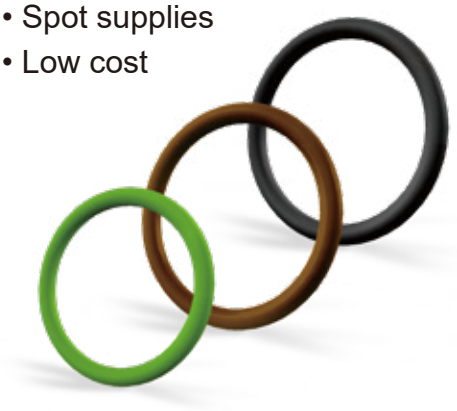
FKM FK1 standard fluoroelastomer

fluoroelastomer

KATON® FKM FK1 series is a standard fluorine binary fluoroelastomer; The application can meet the requirements of low permanent compression variant. Widely used in mechanical seals of automobiles, fluid power equipment, factory equipment and chemical plants. Extend the planned maintenance period, FKM FK1 series is the perfect choice for dynamic and static sealing in terms of improving mechanical strength, low particle generation and excellent sealing life performance, and low holding cost.

KATON® FKM FK1 series characteristics include:

- Good high-temperature resistance
- Complete specifications
- Good acid resistance
- Spot supplies
- Low cost



Model Selection and Application

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
FK60BK-036	60	Black	66%	-5°C~220°C	Softer used under low pressure
FK65BK-011	65	Black			Softer used under low pressure
FK70BK-005	70	Black			Generally used, wide industrial application.
FK75BK-007	75	Black			Generally used, wide industrial application.
FK90BK-010	90	Black			Generally used, stronger in high pressure.
FK70BR-001	70	Brown			Low-pressure parts used, locomotive works application.
FK75BR-004	75	Brown			Generally used, vacuum industry application.
FK90BR-007	90	Brown			High hardness engine part design
FK65GN-001	65	Green			Low hardness automobile truck maintenance
FK70GN-002	70	Green			Standard hardness automobile truck maintenance
FK75GN-003	75	Green			High hardness automobile truck maintenance,
FK90BK-002	90	Black			AED explosion-resistant decompression series

Competitor Brand

Seal Brand	Model
VITON®	A
Dyneon 3M	MIP FE56
Dai-EI™	G7000
Tecnoflon	FOR537/432
Solvay	N935

FKM FK2 standard tri-fluoroelastomer

specfluoroelastomer

KATON® FKM FK2 series is a ternary fluoroelastomer polymer with medium physical property and high fluorine content. FKM FK2 Series has excellent resistance to low-grade chemicals, excellent processability and optimized compression characteristics, and extremely low compression permanent strain.

KATON® FKM FK2 series can be combined with other metal materials such as aluminum and iron; It can be made into shaft seals, valve seals, gaskets or any special-shaped objects that need chemical resistance by molding and injection conversion.

KATON® FKM FK2 series characteristics include:

- High vacuum and low air permeability
- Excellent impact resistance
- Strong acid tolerance
- Heat resistance

Model Selection and Application

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
SF60BK-018	60	Black	68%	-5°C~220°C	Better chemical-resistance than FKM FK1, used under low pressure, softer.
SF75BK-019	75	Black			Better chemical-resistance than FKM FK1, high physical and mechanical strength, low temperature resistance.
SF60WH-011	60	Creamy White			Better chemical-resistance than FKM FK1, used under low pressure, softer.
SF70WH-013	70	White			Better chemical-resistance than FKM FK1, high physical and mechanical strength, low temperature resistance.
SF70WH-012	70	Creamy White			Better chemical-resistance than FKM FK1, high physical and mechanical strength, low temperature resistance.
SF85WH-011	85	Creamy White			Better chemical-resistance than FKM FK, high physical and mechanical strength, low temperature resistance.

Competitor Brand

Seal Brand	Model
VITON®	B-/F-/GF
Dyneon 3M	FLS2650/FC2260
Dai-El™	GS eries
Tecnoflon	P959/P757
Solvay	Solexis

FKM FK3 cold and chemical resistant fluoroelastomer

specfluoroelastomer

KATON® FKM FK3 series provides extremely low temperature flexibility (TR10 = -40℃). Like all other KATON® peroxide curable products, this series has excellent processability, excellent mechanical properties and sealing effect. In addition, it only needs a very short post-curing process. FKM FK3 series still has very good elasticity in low temperature environment; At the same time, good chemical resistance, mechanical properties and sealing ability are retained. Under the same environment, it is twice as long as that of FK1 and FK2. FKM FK3 series shows improved processability and similar fluid tolerance in aromatic hydrocarbon, alcohol, methanol, water, steam and acid; exhibits excellent physical properties and high elongation.

KATON® FKM FK3 series characteristics include:

- Good abrasion resistance and flexibility
- Low temperature characteristics
- Very good chemical resistance
- High molecular density
- Corrosion-resistant
- Excellent stability

Model Selection and Application

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
SF70WH-009	70	White	65%	-40°C~230°C	Vehicle cooling and fuel system, low temperature, good corrosion and abrasion resistance
SF75BK-005	75	Black			Ultra-low temperature freezing equipment and fuel system, low temperature, good corrosion and abrasion resistance
SF80BK-021	80	Black			High-pressure refrigeration equipment and fuel system, low temperature, good corrosion and abrasion resistance.

Competitor Brand

Seal Brand	Model
VITON®	GFLT/GF/GBL
Dyneon 3M	TM LTFE
Dai-EI™	LT302
Tecnoflon	PL series
Solvay	Solexis VPL

FEPM-E PF80E optimized alkali and steam resistant fluoroelastomer

specfluoroelastomer

KATON® FEPM-E PF80E optimized alkali-resistant and steam-resistant fluoroelastomer has excellent durability against acid, alkali, amine and other reinforcing chemicals, which is a characteristic that general vinylidene fluoride elastomer seals do not have, and it can still keep the sealing performance even when the concentration or temperature of these chemicals is very high, suitable for all kinds of antirust agents of amine chemicals, contact parts of automobile lubricating oil, chemical plant processes, petroleum refining, high-heat steam and other environments, and it still maintains its excellence in high-concentration corrosive drugs and high-temperature conditions.

KATON® FEPM-E PF80E optimized alkali-resistant and steam-resistant fluoroelastomer characteristics include:

- Excellent durability in amine chemicals
- Maintaining excellent heat recovery performance
- Excellent performance in heat exchanger
- Excellent mechanical strength
- Used for high saturated steam
- Drug resistance stability
- Strong alkali resistance
- Good heat resistance

Model Selection and Application

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
SF75BK-001	75	Black	70%	-15°C~250°C	Medium-grade chemical application, good resistance to amines, alkalis .
SF80BK-003	80	Black			Medium-grade chemical application, good resistance to amines, alkalis and steam.
SF75WH-002	75	White			Medium-grade chemical application, good resistance to amines, alkalis and steam.
SF80WH-010	80	White			Special for touch panel process.

Competitor Brand

Seal Brand	Model
VITON®	Extreme ETP 600s
Aflas	100s/150p/300s
Solvay	BR 9151

FFKM PF325/326 chemical-resistant perfluoroelastomer

perfluoroelastomer

KATON® FFKM chemical-resistant perfluoroelastomer series is a perfluoroelastomer with all-round chemical resistance, which can be used in the sealing environment of corrosive media and has excellent permanent compression strain. Good resistance to corrosive substances, such as hot organic, inorganic acid, caustic soda, ketone, acetaldehyde, esters, ethers, alcohols, fuel oil, acid gas, hydrocarbon, steam, hot water, ethylene, propylene or process steam, etc.This series can also cope with high-activity pharmaceutical raw materials and corrosive cleaners, especially suitable for semiconductor industry, chemical treatment process, petroleum industry, aviation and heat-resistant industry, and can resist more than 20,000 kinds of chemicals.

KATON® FFKM chemical-resistant perfluoroelastomer series characteristics include:

- Low permeability characteristic
- Excellent chemical resistance
- Wide application of chemicals
- Excellent plasma resistance
- Optimum heat resistance

Model Selection and Application

FFKM PF325

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
PF75WH-001	75	White	72%	-10°C~260°C	Perfluorinated seals, suitable for most of chemicals.

FFKM PF326

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
PF75BK-001	75	Black	72%	-10°C~260°C	Perfluorinated seals, suitable for most of chemicals.

Competitor Brand

FFKM PF325

Seal Brand	Model
Kalrez®	6380
PPE	G74S
TRPlast®	260W
Chemraz	513/E38
Pororoca	G80C

FFKM PF326

Seal Brand	Model
Kalrez®	6375
PPE	G70A
TRPlast®	260B
Chemraz	505
Pororoca	875B

FFKM PF586/587 high temperature perfluoroelastomer

perfluoroelastomer

KATON® FFKM high temperature perfluoroelastomer is high-purity perfluoroelasticity with high balance of various states. It provides enhanced chemical gas resistance and longer sealing life through aggressive and active high-temperature plasma applications. It has excellent ozone, ammonia, fluorine and oxygen free radicals and excellent thermal stability. Main applications: seals, gaskets, valve bodies, butterfly valves, pump housings and stators, metal bonding parts, diaphragms, contours, etc. It is suitable for chemical and petrochemical industries such as mechanical seals, pumps, compressors, valves, reactors, mixers, sprayers, distributors, quick connectors, control keys and instruments, hydrocarbon processing, petroleum exploration and refining, aerospace and semiconductor manufacturing industries.

KATON® FFKM high temperature perfluoroelastomer characteristics include:

- Semiconductor process application
- Low permeability characteristic
- Excellent chemical resistance
- Excellent plasma resistance
- Optimum heat resistance

Model Selection and Application

FFKM PF586

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
PF75WH-002	75	White	72%	-10°C~318°C	Perfluorinated seal, better high temperature resistance.

FFKM PF587

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
PF75BK-002	75	Black	72%	-10°C~318°C	Perfluorinated seal, better high temperature resistance.

Competitor Brand

FFKM PF586

Seal Brand	Model
Kalrez®	8085
PPE	G75S
TRPlast®	316B
Chemraz	HT300
Pororoca	252W

FFKM PF587

Seal Brand	Model
Kalrez®	4079/6190
PPE	551/555/694
TRPlast®	316B
Chemraz	615/551
Pororoca	251B

6 KATON® Exclusive Filler Technology

Suitable industries:

Semiconductor, flat panel display and photoelectric industry, food, beverage and dairy industry, biotechnology industry.

Global Exclusive Patent Filler Technology

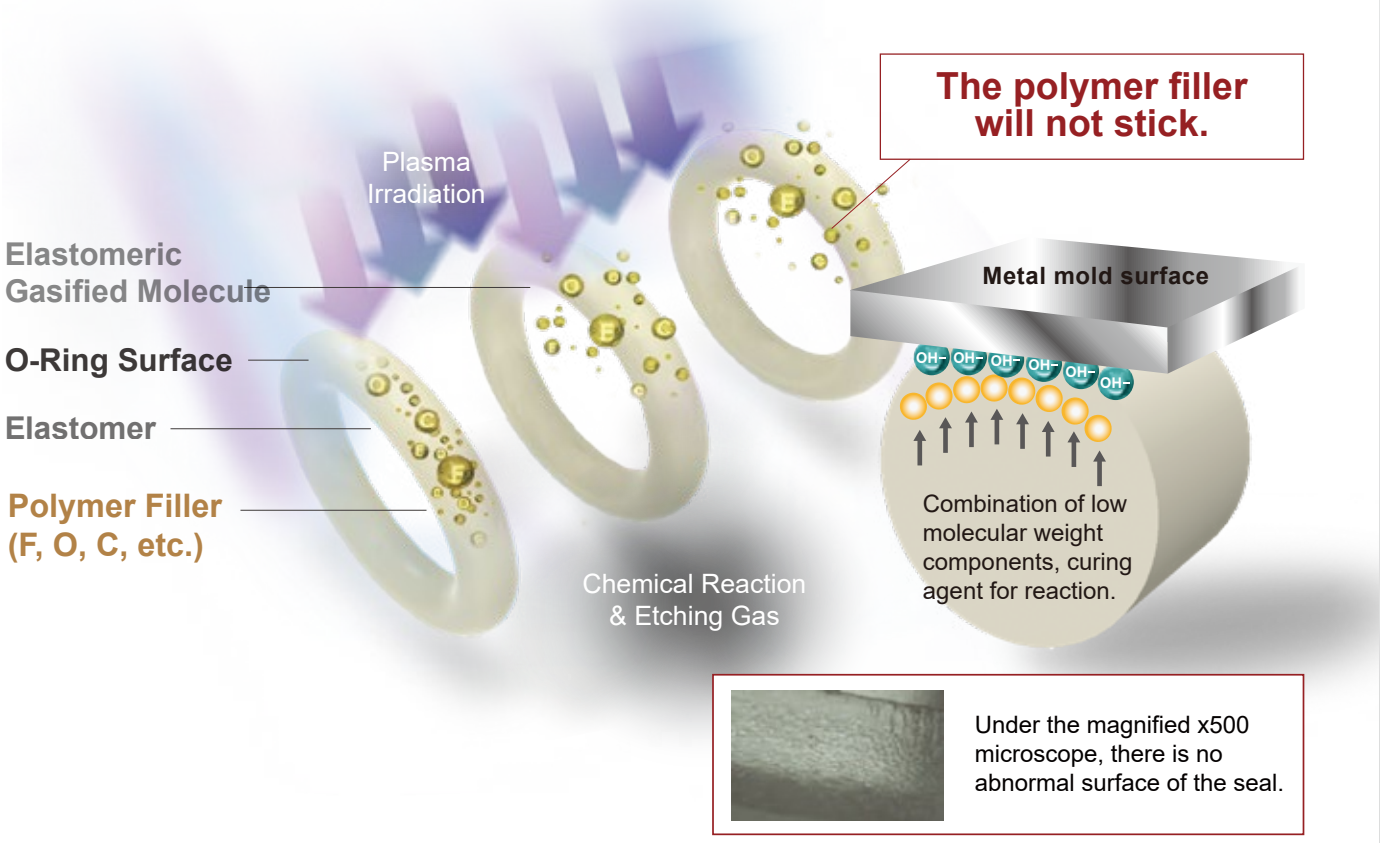
Katon® Polymer Filler

KATON® latest polymer filler with special formula basically only contains carbon, fluorine and oxygen, which is crosslinked by a proprietary curing system. It is specially used in etching and chemical vapor deposition processes to reduce the release of polymer metal filler, reduce particle pollution caused by deterioration of seals, and still maintain excellent sealing function in corrosive plasma environment.

High-purity elastomer polymer seal specially used in high-cleanliness environment is especially suitable for high-intensity plasma attack at high temperature. And under the destructive fluorine and oxygen plasma, it has extremely low erosion rate and weight loss. Excellent chemical resistance to ammonia, ozone and water vapor, compression resilience and ultra-low outgassing.

Polymer Filler Outgassing Process

When fluoroelastomer and polymer fillers are degraded by plasma, the harmless volatiles formed can be safely discharged, which reduces the possibility of particle and metal pollution, and does not cause problems such as seal sticking.



Under the magnified x500 microscope, there is no abnormal surface of the seal.

KATON® FKM high cleanliness fluoroelastomer

fluoroelastomer

KATON® FKM high cleanliness fluoroelastomer series is a durable, cost-effective seal, and meets various regulatory requirements for food contact equipment and storage.This series is used in the field of biological sciences, specifically for: pharmaceutical, pharmaceutical packaging and food and beverage industries that need the highest safety, temperature and chemical resistance standards in production. Low releasability, ensuring safety, efficiency and cleanliness. As the seal is installed in the process machinery and equipment, it can touch the raw materials for making food, so the materials fully comply with various relevant laws and regulations, such as CIP and SIP.

KATON® FKM high cleanliness fluoroelastomer series characteristics include:

- Functional compliance with FDA
- The surface finish is not sticky
- No pollution after aging
- Zero metal filler release
- Excellent elastic seal

Model Selection and Application

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
SF70CR-001	70	Beige	66%	-20°C~220°C	Wide chemical resistance and low outgassing characteristics.
SF75CR-006	75				
SF80CR-009	80				

Competitor Brand

Seal Brand	Model
Materials with no similar properties in the market	

KATON® TPF high cleanliness thermoplastic elastomer

thermoplastic elastomer

KATON® TPF high cleanliness thermoplastic elastomer series is a fluorine-containing elastomer (thermoplastic fluorine-containing elastomer) that can be used when there are high requirements for cleanliness and chemical resistance. Its main applications are for semiconductor manufacturing, such as UV process in vacuum etching equipment and liquid crystal panel manufacturing, and high ozone concentration manufacturing, such as air exchangers in food factories. This series is the filler of the side frame structure, so it is not necessary to connect fillers that may cause pollution traditionally, such as carbon black, inorganic minerals, or white inorganic fillers, such as barium sulfate, titanium dioxide, silica, alumina and aluminum silicate, in order to strengthen the structure. The above fillers can make the polymer have ion resistance. When the polymer is impacted by electric ions, it will immediately separate the discontinuous particles, but it may also pollute the operating environment. The fluorine elastomer polymer with side frame structure has the same protection effect, but it will not produce pollution particles.

KATON® TPF high cleanliness thermoplastic elastomer series characteristics include:

- Excellent mechanical tear
- Zero metal filler release
- Excellent weight loss rate
- Low leakage and friction
- Low hardness and high oxygen resistance

Model Selection and Application

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
TPF65CR-008	65	Amber	65%	-10°C~200°C	For plasma and ozone, it has excellent weightlessness rate, greatly reduces the possibility of particle generation, and has high application tolerance.
TPF70CR-009	70				
TPF75CR-010	75				

Competitor Brand

Seal Brand	Model
VALQUA	AC4640

KATON® FEPM-P high cleanliness specfluoroelastomer

specfluoroelastomer

KATON® FEPM-P high cleanliness specfluoroelastomer series can use 99% of oils and chemicals on the market and high-temperature equipment. Its O-ring, D-ring, lip seal, fluid filter seal, injector seal and other elastomer parts are specially designed for long-term harsh environment use. It is necessary to provide motor vehicle fluid resistance to maintain the reliability of long-term work at high and low temperatures. It provides reliable performance in modern mechanical transmission systems. Nowadays, many mechanical motion systems are designed for reduced maintenance or zero maintenance. They must be operated within the manufacturer's warranty period. It is necessary to ensure that the liquid is free from leakage and pollution and works efficiently.

KATON® FEPM-P high cleanliness specfluoroelastomer series characteristics include:

- Suitable for high and low temperature environments
- High resistance to acid, alkali, amine and steam
- Mineral oil, vegetable oil, grease and gearbox oil
- Liquefied petroleum gas (LPG), gas
- Aromatic hydrocarbons (benzene, toluene)
- Zero metal filler release
- Good heat resistance
- Chlorinated water
- High vacuum

Model Selection and Application

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
FE65CR-001	65	Transparent Amber	68%	-15°C~250°C	Keep the characteristics of temperature resistance and steam resistance of tri-elastomer, excellent compression deformation rate and low release characteristics.
FE70CR-002	70				
FE75CR-003	75				

Competitor Brand

Seal Brand	Model
PPE	A75H/A90H
TRPlast®	F336

KATON® FFKM high cleanliness perfluoroelastomer

perfluoroelastomer

KATON® FFKM high cleanliness perfluoroelastomer series is a kind of fluorine-containing elastomer , and it is suitable for semiconductor manufacturing which needs highly clean and low particle working environment. the latest polymer filling technology has high resistance to plasma, thus reducing the possibility of pollution.This series is specially designed to achieve low erosion and ultra-low particle generation in harsh plasma environment. It has excellent thermal stability, extremely low outgassing, excellent elastic recovery and good mechanical strength, so it is very suitable for static and dynamic sealing applications.

KATON® FFKM high cleanliness perfluoroelastomer series characteristics include:

- Zero metal filler release (low extractable rate)
- Excellent plasma resistance
- Conform to food standards
- High chemical resistance
- Semiconductor process
- High wear resistance and low modulus

Model Selection and Application

Type	Shore A	Color	Fluorine content	Working Temp.	Utility
PF70CR-001	70	Creamy White	72%	-10°C ~ 318°C	Very pure without any inorganic filler, excellent chemical resistance and temperature resistance and excellent elastic recovery.
PF75CR-002	75				
PF80CR-003	80				

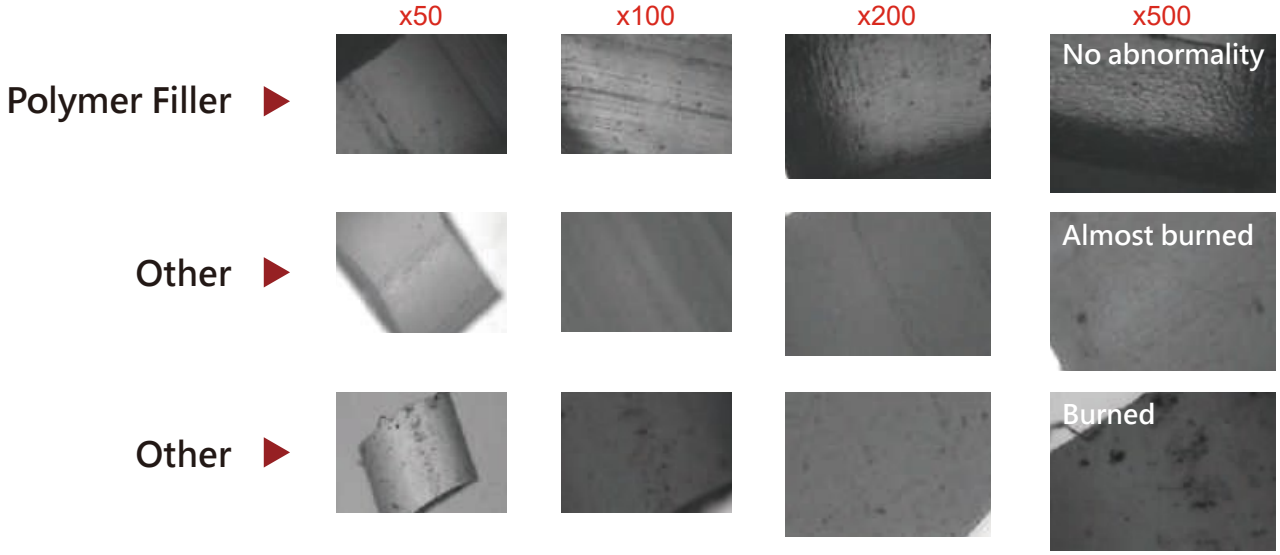
Competitor Brand

Seal Brand	Model
Kalrez®	9100
PPE	G70C
Chemraz	XPE-HP
Dupra	DU341

Katon® unique high-temperature elastomer curing technology

High temperature catalyst is used to initiate the crosslinking reaction of high temperature perfluoroelastomer, which is the highest level of heat resistance and chemical resistance in elastomers. Helps to prevent HTS (high thermal oxidation stability) which contains corrosive additives to attack other elastomers.

Surface condition of seal under microscope



What is the reason for the similar water mark phenomenon on the surface of polymer filler seal

Many fluorine molecules are bonded in the polymer, and the molecules are constantly moving. There are some attractive or repulsive forces between them, and the intermolecular forces intersect, but there is also the orbital overlap between the highest occupied orbital and the lowest vacant orbital of another molecule, commonly known as "van der Waals force phenomenon".

The future trend of fluoroelastomer

Fluorine-containing molecules and fragments released by traditional metal fillers at high temperature will lead to the tip discharge of the circuit, and may also cause problems such as slow vacuum pump, blockage of exhaust gas pipeline, deterioration of yield and inability to improve efficiency. Therefore, as the semiconductor process enters seven nanometers, the precise control of chemical vapor deposition process is very important. KATON® exclusive polymer filler technology, which has no metal filler release and low pollution, can improve the yield and efficiency of semiconductor process, and is bound to become the future trend of fluoroelastomer seals.

7 Storage Method

The physical properties of most elastomers will change during storage, and the service life of these products will be greatly prolonged by taking some simple precautions.

Storage conditions of fluoroelastomer seals

For the preservation, cleaning and maintenance methods of fluoroelastomer seals, please refer to international standards, such as DIN 7716/BS3F68: 1977, ISO2230 or DIN9088. The following table provides the most suitable preservation methods of fluoroelastomer seals according to various standards.

Material	Environment	Preventive measures
Oxygen and ozone	Ozone is particularly harmful to some fluoroelastomer seals, so the storage room should not be equipped with any equipment that will produce ozone, such as air filters, mercury, fluorescent lamps, high-voltage electrical appliances, motors and electrostatic equipment. Burning gas and organic vapor may all produce ozone through photochemical reaction.	Store fluoroelastomer seals in vacuum packaging bags, or use a suitable storage room to avoid air circulation.
Humidity	The temperature of the storage room should be lower than 70%, too dry or too wet should be avoided, and there should be no condensation in the environment.	Put it in an air conditioning system with humidity control.
Illumination	Fluoroelastomer seals should be protected from direct sunlight and strong ultraviolet light.	The packaging bag must provide anti-ultraviolet function, and the storage room can be covered with red or orange paint, and the windows should be sealed with curtains.
Heat	If it is required to be stored at a low temperature, avoid direct contact with the heater and heat sink, which will harden the fluoroelastomer seal. Before use, the temperature of the article should be adjusted to 20℃.	The optimum storage temperature is 5℃ and 25℃.
Radiation	All precautions must be taken to prevent ionizing radiation sources that may damage the seals.	Stay away from radiation sources.
Deformation	The fluoroelastomer seal is stored in a relaxed state without tension, compression or deformation. When the goods are packaged in an unstrained state, the goods should be kept in the original packaging bag.	Avoid vacuum packaging products and putting too many products in a bag after the production is put in storage.
Contact with liquid and semi-solid materials.	Fluoroelastomer seals are not allowed to come into contact with solvents, oil, grease or other semi-solid materials, especially volatile solvents at a distance of 10 meters may corrode fluorine rubber seals.	If this is the case in the manufacturer's package when leaving the factory, in addition, special storage area for fluoroelastomer seals.
Contact with metallic and nonmetallic materials.	Most of the metals, such as manganese, iron, copper, brass and their mixtures, are in direct contact, which will do harm to the fluoroelastomer seals.	As plasticizer or other components may migrate, they should not come into contact with PVC during storage, and different types of fluoroelastomer seals should be stored separately.
Clean	The fluoroelastomer seal can be cleaned with soapy water or alcohol, but not with water to clean fabric reinforcing elements, adhesive sealing rings and polyurethane rubber, and disinfectant or other organic solvents.	The standard cleaning procedure is ionic water cleaning, but if it is not washable, it must be wiped easily with high volatility such as isopropyl alcohol and dried in the greenhouse.

Katon® is your best answer.

We provide excellent chemical, heat-resistant and sealing seals. Our products are suitable for use in the most challenging environment. If you are looking for high-quality and reasonable-priced seals to meet your efficiency and reliability, we must be your first choice.

Katon® can guarantee

- Complete international standard mold.
- The most advanced production equipment.
- Short and on-time delivery.
- Competitive price.
- Good communication channel.
- ISO-9001 quality certification.
- High-level human resources.

The information and compatibility of this catalogue are considered to be standard and reliable; All product dimensions are manufactured according to ASTM tolerance standards, and technicians must carefully evaluate the environment and workpieces before using them when referring to this information

Comparison table of related elastomer companies

Company Name	Seal Brand
Chemours from the USA, fluoroelastomer FKM brand	VITON®
Dupong from the USA perfluoroelastomer FFKM brand	KALREZ®
3M from the USA fluoroelastomer FKM brand	Dyneon
Solvay from Italy fluoroelastomer FKM brand	Solexis
Daikin from Japan fluoroelastomer FKM brand	Dai-El™
Greene Tweed from Singapore	Chemraz
AIR WATER MACH	Pororoca

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Finished Product Plant	No.21, Ln.349, Zhongzheng S Rd, Yongkang Dist., Tainan City 71067, Taiwan
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