Product Selector Guide

DuPont™ Kalrez® Perfluoroelastomer Parts

in Chemical Process Industry

Recognized as the leading supplier of perfluoroelastomer parts for over 40 years, DuPont offers a variety of high performing products that are formulated to give the best possible seal performance in numerous aggressive environments. Excellent balance of finished properties is achieved through careful use of proprietary polymers, cure systems, fillers and additives, resulting in superior seals for a broad range of applications.

This Selector Guide summarizes key physical properties and attributes of the most commonly used Kalrez® products for the Chemical Process Industry, providing general chemical compatibility guidance.

For more detailed information about each product, please consult the DuPont™ Kalrez® Application Guide online or contact your DuPont regional location to request assistance from a Kalrez® Technical Service & Development Engineer to assess performance fit in your specific application.

Product Selector Guide

Kalrez® Grades	General Purpose				Specialty						
	6375	MS220	4079	7075	7090	7275	7375	7390	6380	0040	0090
Acids	Suitable	Suitable	Best	Best	Best	Suitable	Suitable	Suitable	Suitable	Best	Suitable
Inorganic Bases	Best	Best	Suitable	Suitable	Suitable	Suitable	Best	Best	Best	Suitable	Best
Hydrocarbons	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best
Solvents	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best
Water/Steam up to 200 °C (392 °F)	Best	Best	Not Suggested	Not Suggested	Not Suggested	Suitable	Best	Best	Suitable	Not Suggested	Best
Water/Steam above 200 °C (392 °F)	Suitable	Suitable	Not Suggested	Not Suggested	Not Suggested	Not Suggested	Best	Best	Not Suggested	Not Suggested	Suitable
Amines (Organic Bases)	Suitable	Suitable	Not Suggested	Not Suggested	Not Suggested	Suitable	Suitable	Suitable	Best	Not Suggested	Best
Vinyl or Acrylic Monomers	Suitable	Suitable	Not Suggested	Not Suggested	Suitable	Best	Suitable	Suitable	Suitable	Not Suggested	Suitable
Silanes and Chlorosilanes	Suitable	Suitable	Suitable	Suitable	Suitable	Best	Suitable	Suitable	Not Suggested	Not Suggested	Not Suggested
Synthetic Oils	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best
Strong Oxidizers (e.g., Nitric Acid, O_3 , ClO_2)	Not Suggested	Not Suggested	Not Suggested	Not Suggested	Not Suggested	Best	Not Suggested	Not Suggested	Suitable	Not Suggested	Not Suggested
Aldehydes	Suitable	Suitable	Suitable	Best	Best	Best	Best	Best	Suitable	Not Suggested	Best
Streams (unknown composition)	Best	Best	Not Suggested	Not Suggested	Not Suggested	Suitable	Best	Best	Best	Suitable	Suitable
Pure Ethylene / Propylene Oxide	Suitable	Not Suggested	Not Suggested	Not Suggested	Not Suggested	Best	Suitable	Suitable	Best	Not Suggested	Best
Dry Heat	Suitable	Not Suggested	Best	Best	Best	Suitable	Best	Best	Not Suggested	Not Suggested	Suitable
High Pressure / Extrusion Resistance	Not Suggested	Not Suggested	Not Suggested	Not Suggested	Best	Not Suggested	Suitable	Best	Not Suggested	Not Suggested	Best
RGD Resistance*	Not Suggested	Not Suggested	Not Suggested	Not Suggested	Suitable	Not Suggested	Not Suggested	Suitable	Not Suggested	Not Suggested	Best

Best Suitable Not Suggested

* Rapid Gas Decompression
Depending on Pressure conditions, some Kalrez® grades might exhibit a suitable resistance.
Please refer to the Kalrez® 0090 technical datasheet for RGD testing details and applicable certifications/qualifications.

Current Kalrez® Product Offering

General Purpose

Kalrez® Spectrum™ 6375
Broadest Chemical Resistance

Kalrez® 6375 parts, developed specifically for the chemical processing industry, are designed to give **outstanding performance in the widest possible range of chemicals and temperatures**.

This product is an excellent choice for use in acids, bases, amines, steam, ethylene oxide, and many other aggressive chemicals. The curing system also allows for a maximum service temperature of 275°C (527°F). This high temperature stability translates to increased chemical resistance over all temperature ranges, especially if high temperature process excursions occur. This combination of chemical and thermal resistance provides advantages for chemical processors.

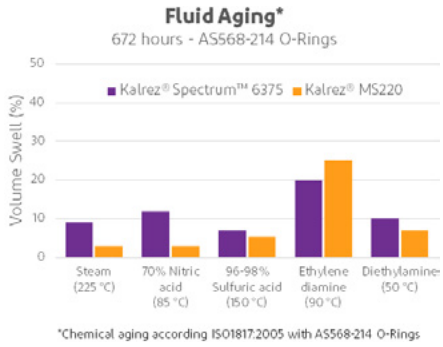
Kalrez® Spectrum™ 6375 O-rings

Kalrez® MS220
Superior Chemical Resistance
Shorter lead-time & cost-effective compound

Kalrez® MS220 perfluoroelastomer parts are designed for chemical processing and mechanical seals applications where **superior chemical resistance** and low compression set are critical for successful sealing performance.

Kalrez® MS220 continues the DuPont tradition of providing high value in use perfluoroelastomer parts to extend equipment Mean Time Between Repair (MTBR), while offering an excellent combination of properties **(resistance to steam, acids and bases)** at temperatures up to 230 °C (446 °F).

Kalrez® MS220 parts can be a suitable alternative to Kalrez® 6375 parts in applications where service temperatures range remain between -15 °C (5 °F) and 200 °C (392 °F).

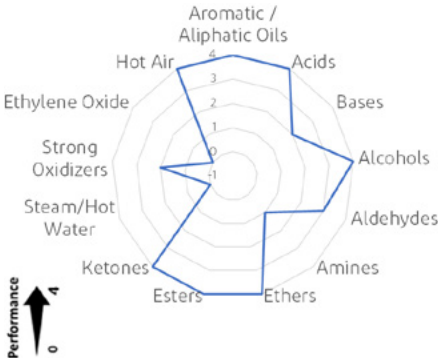


Kalrez® MS220 vs Kalrez® Spectrum 6375 Chemical resistance

Kalrez® 4079
High Temperature – High Mechanical Strength

Kalrez® 4079 parts are a low compression set product for **general purpose use in O-rings**, diaphragms, seals and other parts used in the chemical process and aircraft industries.

It is a carbon black filled product with excellent chemical resistance, good mechanical properties, and outstanding hot air aging properties. It exhibits low swell in organic acids, inorganic acids and aldehydes, and has good response to temperature cycling effects. A maximum service temperature of 316°C (600°F) is suggested, with short excursions to higher temperatures possible. **Kalrez® 4079 is not recommended for use in hot water/ steam applications or in contact with certain hot aliphatic amines, ethylene oxide, or propylene oxide**.



Typical product positioning of Kalrez® 4079

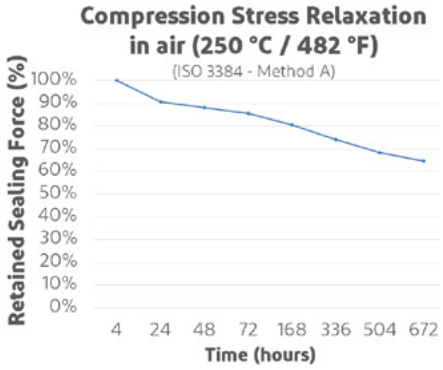
Kalrez® Spectrum™ 7075
Highest Temperature Resistance - Lowest Compression Set

Kalrez® 7075 parts are a carbon black filled product that has **enhanced physical performance properties including very low compression set and improved seal force retention**. This product is designed for improved sealing performance in both high temperature environments and temperature cycling situations.

Kalrez® 7075 provides even greater sealing performance in dynamic applications where low friction is required and it was specifically developed to be used in the chemical and hydrocarbon processing industries, with an improved thermal resistance that extends maximum service temperature to 327°C (620°F).

Kalrez® 7075 offers the enhanced elastomeric properties outlined above while providing chemical resistance better than the industry standard, set by Kalrez® 4079.

Kalrez® 7075 is not recommended for use in hot water/steam applications; for such cases, please use Kalrez® Spectrum™ 7375.



Compression Stress Relaxation of Kalrez® Spectrum™ 7075 in air (250 °C / 482 °F)

Specialty Products

Kalrez® Spectrum™ 7090

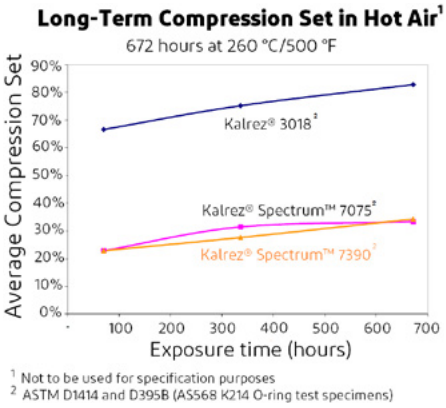
High Temperature - High Hardness

Kalrez® 7090 parts are specifically targeted for use in applications requiring **high hardness/ higher modulus properties**. These specialty black parts have excellent mechanical properties including compression set resistance, seal force retention, response to temperature cycling effects and rapid gas decompression resistance.

Kalrez® 7090 parts are well suited for both static and dynamic sealing applications, especially applications that require extrusion resistance at higher temperatures. They also offer **outstanding thermal stability and chemical resistance**.

Kalrez® 7090 is not recommended for use in hot water/steam applications; for such cases, please use Kalrez® Spectrum™ 7390.

A maximum service temperature of 325 °C (617 °F) is suggested. Short excursions to higher temperatures may also be possible.



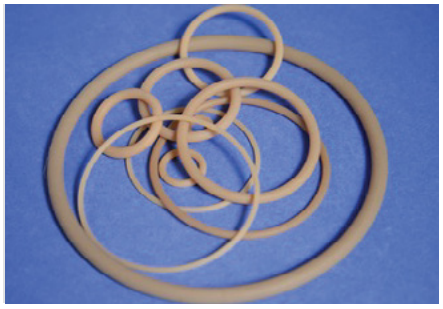
[1] Not to be used for specification purposes
[2] ASTM D1414 and D395B (AS568 K214 O-ring test specimens)

Kalrez® Spectrum™ 7090 – Long-Term Compression Set analysis

Kalrez® Spectrum™ 7275

Oxidizing & Reactive Chemical Environments

Kalrez® 7275 parts are a light brown product based on a proprietary crosslinking system targeted specifically for the chemical processing industry. It exhibits **minimal swelling and improved retention of physical properties when exposed to aggressive chemicals**, e.g., concentrated nitric acid, organosilanes, chlorosiloxanes, pure ethylene oxide, butyraldehyde, amines and vinyl and acrylic monomers. It also has excellent compression set resistance and good retention of physical properties after aging at high temperatures. A maximum service temperature of 300 °C (572 °F) is suggested.

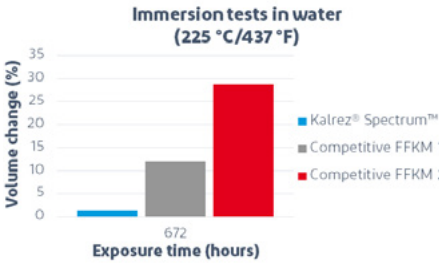


Kalrez® Spectrum™ 7275 O-rings

Kalrez® Spectrum™ 7375

High Temperature
Broad Chemical & Water/Steam resistance

Kalrez® 7375 parts are an innovative FFKM product based on a patented crosslinking system for chemical process industry applications where **broad chemical and water/ steam resistance** are needed at elevated temperatures. Kalrez® 7375 parts exhibit excellent compression set resistance, outstanding physical property retention, and good mechanical strength properties. A maximum service temperature of 300 °C (572 °F) is suggested.



Kalrez® Spectrum™ 7375 – Our best compound for use in hot water / steam

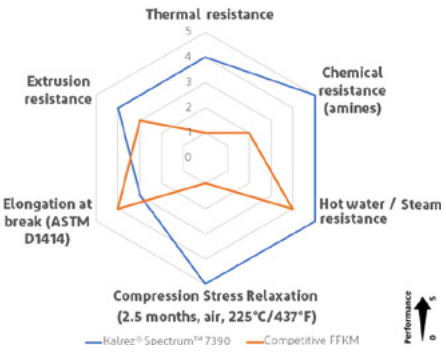
Kalrez® Spectrum™ 7390

High Temperature - High Hardness
Broad Chemical & Water/Steam Resistance

Kalrez® Spectrum™ 7390 perfluoroelastomer parts is a versatile FFKM product based on a patented proprietary crosslinking system that can meet your 90 durometer (Shore A) FFKM specifications in numerous shapes and configurations where higher mechanical strength is needed.

Kalrez® Spectrum™ 7390 parts are designed to **reliably seal in the most demanding chemical and hot water/steam environments**.

Thermally stable up to 300 °C (572 °F), it is an ideal fit for downstream and CPI applications such as valves, compressors, pumps, process instrumentation and sensors as well as mechanical seals.



Product positioning – Kalrez® Spectrum™ 7390 vs. competitive FFKM

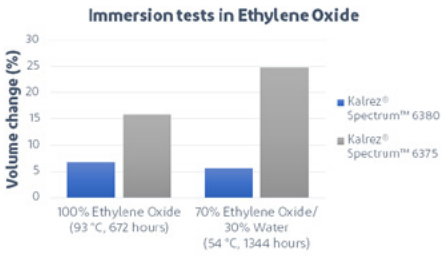
Kalrez® Spectrum™ 6380

Strong Amines

Kalrez® 6380 parts are a non-black product specifically developed for chemical processes involving **hot, aggressive amines**. In addition, it has **excellent overall chemical resistance**.

This cream-colored product is easily identifiable when selecting an O-ring material for harsh chemical plant services. This material has excellent mechanical properties and is a top choice for both static and dynamic sealing applications.

A maximum service temperature of 225 °C (437 °F) is suggested while short-term excursions to higher temperatures are permissible.



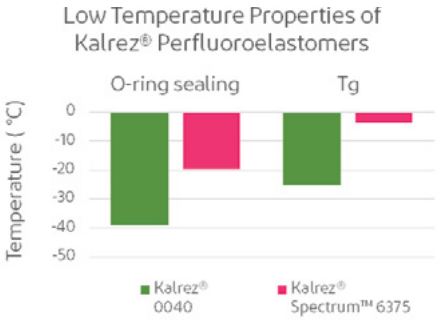
Kalrez® Spectrum™ 6380 weight change in Ethylene Oxide (still the preferred Kalrez® option for Ethylene Oxide / Water mix)

Kalrez® Spectrum™ 0040

Low Temperature

Kalrez® 0040 parts are specifically designed for low temperature environments where **significant chemical resistance** is required. **Low temperature sealing performance (-42 °C / -44 °F)** typically unattainable for perfluoroelastomers parts is achievable with Kalrez® 0040.

Kalrez® 0040 is an excellent choice in applications such as couplings for the chemical transportation industry or for other applications where chemical resistance and elasticity are required in some of the coldest environments.



Low temperature static sealing (DuPont Proprietary test method)

Kalrez® 0090

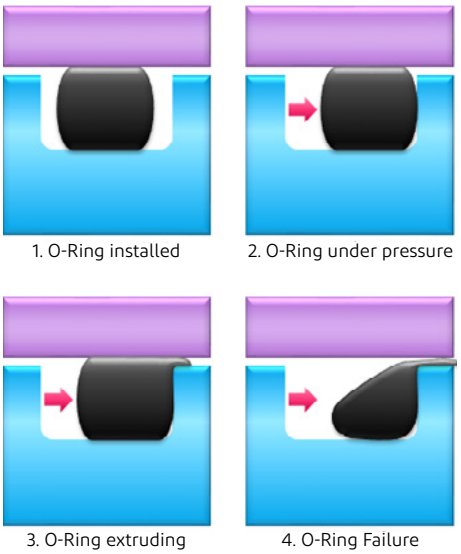
Rapid Gas Decompression (RGD) Resistance

Kalrez® 0090 parts deliver durable, reliable sealing solutions for applications requiring **excellent Rapid Gas Decompression (RGD) properties** as well as **high hardness, high modulus properties**, and **excellent extrusion resistance** (even without backup rings). Potential oil and gas applications include downhole equipment such as drilling and completion tools, as well as industrial equipment including pumps, valves and compressors.

Kalrez® 0090 has been certified by two independent laboratories to meet rigorous requirements for resistance to RGD.

In addition to demonstrated RGD resistance, Kalrez® 0090 seals provide superior performance regarding chemical and temperature properties:

- Chemical resistance:
  Kalrez® 0090 is resistant to chemicals encountered in the oil and gas industry, including sour process streams containing H_2S. (Reference NORSOK M-710 Rev 2 Sour Fluid aging resistance performed by MERL (UK))
- Broad temperature capability:
  Kalrez® 0090 retains good physical properties up to temperatures as high as 250 °C (482 °F) and down to –21 °C (–5.8 °F). Under pressurized conditions, in laboratory tests, Kalrez® 0090 has demonstrated low temperature performance down to –40 °C (–40 °F).



Effects of High Pressure on elastomeric O-rings

Legend:

Thermal | Chemical | Low Temperature | Hot water and steam | High Pressure / Extrusion resistance

Typical Physical Properties*

Kalrez® grade	Color	Service Temperature[1]		Shore A hardness[2]	Modulus at 100% elongation[3]	Tensile Strength[3]	Elongation at Break[3]	Compression Set[4] 70 hours 204 °C (400 °F)
		Lowest	Maximum					
6375	Black	-20 °C (-4 °F)	275 °C (527 °F)	75	9.1 Mpa (1320 psi)	15.2 Mpa (2200 psi)	160%	24%
MS220	Black	-14 °C (7 °F)	230 °C (446 °F)	76	6.9 Mpa (1010 psi)	15.9 Mpa (2310 psi)	154%	24%
4079	Black	-19 °C (-2 °F)	316 °C (601 °F)	75	7.2 Mpa (1050 psi)	16.9 Mpa (2450 psi)	150%	14%
7075	Black	-18 °C (0 °F)	327 °C (621 °F)	75	11.2 Mpa (1630 psi)	17.2 Mpa (2500 psi)	138%	10%
7090	Black	-26 °C (-15 °F)	325 °C (617 °F)	90	14.1 Mpa (2050 psi)	13.7 Mpa (1980 psi)	52%	12%
7275	Light Brown	-20 °C (-4 °F)	300 °C (572 °F)	75	9.7 Mpa (1410 psi)	14.5 Mpa (2100 psi)	160%	22%[6]
7375	Black	-20 °C (-4 °F)	300 °C (572 °F)	77	15.2 Mpa (2200 psi)	20.0 Mpa (2900 psi)	115%	9%[6]
7390	Black	-22 °C (-8 °F)	300 °C (572 °F)	89	21.3 Mpa (3090 psi)	22.1 Mpa (3210 psi)	101%	14%[6]
6380	Cream	-22 °C (-8 °F)	225 °C (437 °F)	80	6.9 Mpa (1000 psi)	15.9 Mpa (2300 psi)	160%	42%
0040	Black	-42 °C (-44 °F)	220 °C (428 °F)	70	5.2 Mpa (750 psi)	9.0 Mpa (1300 psi)	170%	42%
0090	Black	-27 °C (-17 °F)	250 °C (482 °F)	95	14.2 Mpa[5] (2060 psi)[5]	19.5 Mpa (2830 psi)	80%	19%

1 DuPont proprietary test method; useful temperature range may vary with seal design and application specifics
2 ASTM D2240 (pellet test specimens unless otherwise noted)
3 ASTM D412, (dumbbell test specimens)
4 ASTM D395B, (pellet test specimens)
5 Modulus at 50% elongation
6 ASTM D395B & D1414 (AS568 K214 O-ring test specimens)

* Not to be used for specification purposes

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