



Kalrez® perfluoroelastomer parts

A Product of DuPont Dow Elastomers

Compound 1050LF (colour: black)

General Description

Kalrez® 1050LF is a carbon black filled compound having excellent all round chemical resistance.

It also has a good resistance to hot water/steam, excellent amine resistance and good compression set properties. It has a maximum operating temperature of 280°C.

It is a general purpose material, often used in the chemical process industries in the form of O-rings, gaskets and other custom parts.

Compound 1050LF is not recommended for applications where rapid temperature cycling properties are required.

The physical properties of compound 1050LF are as follows :

Physical Properties¹

Hardness ²	Shore A ± 5	82
100 % Modulus ³	MPa psi	12,4 1800
TS at break ³	MPa psi	15,8 2700
Elongation at break ³	%	125
Compression set ⁴ , 70 h at 204°C	%	35

¹ Not to be used for specifications

² ASTM D2240

³ ASTM D412, 500 mm/min (20 in./min)

⁴ ASTM D395 B, pellets

Chemical Resistance

Material Compound	Kalrez 1050LF
<i>Chemical resistance to:</i>	
Aromatic /Aliphatic Oils	+++
Acids	++
Alkalis	+++
Alcohols	+++
Aldehydes	+++*
Amines	+++*
Ethers	+++
Esters	+++
Ketones	+++
Steam /Hot Water	++
Strong Oxidizers	0
Ethylene /Propylene Oxide	-

+++ = excellent

++ = very good

+ = good

0 = marginal

- = poor

-- = not recommended

* = recommended compound for this chemical

Miscellaneous Properties

Many miscellaneous properties are of interest for specific applications. Some of these are unaffected by compound choice while others vary with hardness or extensibility. As an example, coefficient of friction typically increases as hardness decreases.

In general, miscellaneous physical properties are similar to those of Viton® fluoroelastomer.

The following are some of the properties for Kalrez®:

Physical Properties

Specific gravity, g/cm³ 1,90 – 2,00

Miscellaneous

Oxygen – Autogenous Ignition Temperature
 Compound 1050 LF 313°C
 Compound 1045 370°C

Thermal Properties

Linear coefficient of thermal expansion (25 – 250°C)

$$L = L_0 (1 + a\Delta T)$$

$$a = 2,3 \times 10^{-4}/^{\circ}\text{C}$$

Specific heat

at 50°C = 0,945 J/g (0,226 cal/g)
 at 100°C = 0,974 J/g (0,233 cal/g)
 at 150°C = 1,053 J/g (0,252 cal/g)

Permeation Rates of Gases

Gas	Nitrogen	Oxygen	Helium	Hydrogen	Argon	Krypton	Xenon
Temperature, °C	RT	RT	RT	93	93	93	93
Rate**	0,05	0,09	2,5	113	6,1	9,9	19,9

** $\times 10^{-9}$ cm³ - cm
 s - cm² - cm Hg ΔP

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Compound 4079

(colour: black)

General Description

Kalrez® 4079 is a carbon black filled compound having excellent chemical resistance and mechanical properties. It has a maximum operating temperature of 315°C, although short excursions to higher temperatures are possible. It exhibits low swell in organic and inorganic acids and aldehydes and has good response to temperature cycling effects. Kalrez 4079 has outstanding hot air ageing properties and exhibits very low and stable compression set at high temperatures. Its relatively low modulus can be a great help in assembly.

This is a general purpose material suitable for around 95% of all applications in all industries. Some of its uses are O-rings, diaphragms, seals, gaskets and other custom parts.

Compound 4079 is not recommended for applications involving water/steam and aliphatic amines at higher temperature. It should never be used in applications involving ethylene oxide or propylene oxide. The physical properties and chemical resistance of compound 4079 are as follows:

Physical Properties¹

Property	Unit	Value
Hardness ²	Shore A ± 5	75
100% Modulus ³	MPa	7,2
	psi	1050
TS at break ³	MPa	16,9
	psi	2450
Elongation at break ³	%	150
Compression set ⁴ , 70 h at 204°C	%	25

¹ Not to be used for specifications

² ASTM D2240

³ ASTM D412, 500 mm/min (20 in/min)

⁴ ASTM D395 B, pellets

Chemical Resistance

Material Compound	Kalrez 4079
<i>Chemical resistance to:</i>	
Aromatic / Aliphatic oils	+++*
Acids	+++*
Alkalis	+++*
Alcohols	+++*
Aldehydes	++
Amines	0
Ethers	+++*
Esters	+++*
Ketones	+++*
Steam / Hot Water	0
Strong Oxidizers	0
Ethylene / Propylene Oxide	--

+++ = excellent

++ = very good

+ = good

0 = marginal

-- = poor

--- = not recommended

* = recommended compound for this chemical

The major exceptions to the use of compound 4079 are listed below:

Hot water and steam

- Use Kalrez® 2035 up to 210°C.
- Use Kalrez 1050LF up to 280°C.
- Use Kalrez 3018 for high pressure applications.

Propylene/Ethylene oxide

- Use Kalrez 2035.

Hot aliphatic amines – above 80°C (the major aliphatic amines are ethylene diamine and hexamethylene diamine)

- Use Kalrez 3018 up to 280°C.
- Use Kalrez 1050LF up to 280°C.

Physical Properties

Specific gravity, g/cm ³	1,90 – 2,00
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Miscellaneous

Oxygen – Autogenous Ignition Temperature	
Compound 1050 LF	313°C
Compound 1045	370°C

Permeation Rates of Gases

Gas	Nitrogen	Oxygen	Helium	Hydrogen	Argon	Krypton	Xenon
Temperature, °C	RT	RT	RT	93	93	93	93
Rate**	0,05	0,09	2,5	113	6,1	9,9	19,9

** × 10⁻⁹ cm³ - cm
s - cm² - cm Hg ΔP

Miscellaneous properties

Many miscellaneous properties are of interest for specific applications. Some of these are unaffected by compound choice while others vary with hardness or extensibility. As an example, coefficient of friction typically increases as hardness decreases.

In general, miscellaneous physical properties are similar to those of Viton® fluoroelastomer.

The following are some of the properties for Kalrez:

Thermal Properties

Linear coefficient of thermal expansion (25 – 250°C)
$L = L_0 (1 + a\Delta T)$
$a = 2,3 \times 10^{-4}/^{\circ}C$

Specific heat
at 50°C = 0,945 J/g (0,226 cal/g)
at 100°C = 0,974 J/g (0,233 cal/g)
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Kalrez[®] Spectrum[™] perfluoroelastomer parts

A Product of DuPont Dow Elastomers

Kalrez[®] Spectrum[™] 6375

Product Overview

For over 25 years, Kalrez[®] parts have been the sealing material of choice for long term reliable sealing in the harshest chemical environments. Today, elastomeric seals are expected to perform in a variety of even more aggressive chemicals and at higher temperatures. To meet the needs of chemical processors, DuPont Dow has developed a new product that expands on the capabilities of existing Kalrez parts with broader chemical resistance while maintaining the high temperature stability you've come to expect from Kalrez.

Kalrez Spectrum 6375

Kalrez Spectrum 6375, designed specifically for the chemical process industry, combines new polymer technology with innovative patented curing technology. Compound 6375 is 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. Mixed streams, once a problem for many chemical processors, can now be handled by compound 6375. The new curing system also allows for a continuous upper service temperature of 275°C (525°F). This is approximately 100°F higher than other products claiming broad chemical resistance. 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. Today, chemical processors use several perfluoroelastomer parts, including compounds 4079, 1050LF, and 2035, to optimize chemical and thermal performance. Kalrez Spectrum 6375 may be used in many applications to displace these products.

However, if optimum chemical resistance is required, then applications must be individually reviewed for the optimum compound selection.

Table 1
Typical Physical Properties¹

Hardness, Shore A ±5	75
100% Modulus ² , MPa (psi)	7.2 (1050)
Tensile at break, MPa (psi)	15.1 (2200)
Elongation at break, %	160
Compression set ³ , % 70 hr at 204°C (400°F)	30
Maximum service temperature, °C (°F)	275 (525)
Lower service temperature, °C (°F)	-20 (-4)

¹ Not to be used for specifications

² ASTM D412, 500 mm/min

³ ASTM D395 B, O-rings

Table 2
Chemical Resistance

Compound	Kalrez 6375	Kalrez 4079	Kalrez 2035	Kalrez 1050LF
<i>Chemical Resistance to:</i>				
Aromatic/Aliphatic oils	++++	++++	++++	++++
Acids	++++	++++	++++	+++
Bases	++++	+++	+++	++++
Alcohols	++++	++++	++++	++++
Aldehydes	++++	+++	++++	++++
Amines	+++	+	++	++++
Ethers	++++	++++	++++	++++
Esters	++++	++++	++++	++++
Ketones	++++	++++	++++	++++
Steam/Hot water	++++	+	+++	+++
Strong Oxidizers	++	++	++	++
Ethylene Oxide	++++	x	++++	x
Hot Air	+++	++++	++	+++

++++ = Excellent

++ = Good

+++ = Very Good

+ = Fair

x = Not Recommended

Chemical Resistance

For many applications, low volume swell of elastomers is critical to proper operation of equipment. Excessive swell may cause permanent seal failure due to equipment hangup, extrusion, etc. The following data is the result of lab testing to determine the volume swell of Kalrez® Spectrum™ 6375 when exposed to various fluids. Other physical property testing is needed to

further define product performance; however, volume swell is an excellent predictor of performance. The following chemicals were chosen since they are representative of some of the most aggressive applications in the industry. These test results are an indication of the performance of compound 6375; however, all applications are unique, and it is strongly recommended that immersion testing be performed in the actual process fluids.

Chemical	Temperature °C (°F)	Kalrez Spectrum 6375 Rating	Nearest Competitive FFKM
Water	225 (437)	A	C
Glacial acetic acid	100 (212)	A	A
Nitric acid (70%)	85 (185)	B	C
Sulfuric acid (98%)	150 (302)	A	C
Maleic acid	90 (194)	A	B
Ammonium hydroxide	100 (212)	B	B
Ethylene oxide	50 (122)	A	A
Urea	175 (347)	A	B
Epichlorohydrin	100 (212)	A	A
Butyraldehyde	70 (158)	A	B
Toluene diisocyanate	100 (212)	A	B
HCFC 134a	25 (77)	A	A

Exposure time = 672 hr

Rating system:

A: 0–10% volume swell

B: 10–20% volume swell

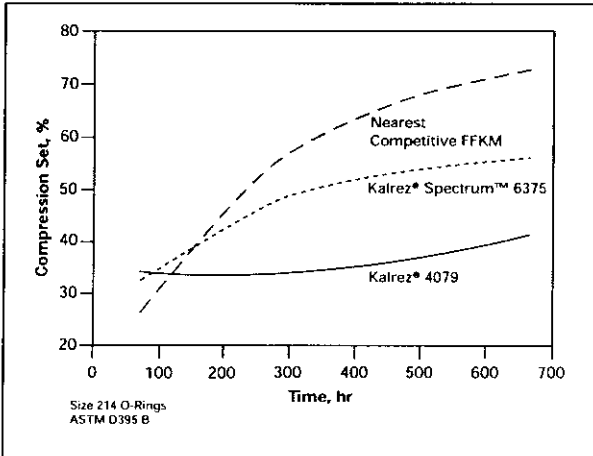
C: >20% volume swell

Thermal resistance

Kalrez® Spectrum™ 6375 has excellent heat resistance to go along with the outstanding chemical resistance. New patented curing technology allows this compound to have a continuous use service temperature of 275°C (525°F). This results in the best combination of chemical resistance and thermal resistance of any elastomer on the market today. One method of

predicting heat resistance is compression set. This is defined as: the amount by which a standard test piece (typically an O-ring or pellet) fails to return to its original thickness after being subjected to a standard compressive load or deflection for a fixed period of time. The chart following shows some elastomer comparisons with regard to compression set resistance.

Compression Set vs. Time at 204°C (400°F)



Compression Set vs. Time at 260°C (500°F)

