



Kalrez[®] perfluoroelastomer
parts

From DuPont Performance Elastomers

Kalrez[®] 4079 for Semiconductor Applications

Compound Description

Kalrez[®] 4079 is a black, low compression set compound for use in many dry and wet semiconductor process environments. It has excellent chemical resistance, good mechanical properties and outstanding thermal stability. Kalrez[®] 4079 exhibits low weight loss in reactive plasmas and has good response to temperature cycling effects. It is not recommended for use in amines. A maximum continuous service temperature of 316°C is suggested. Short excursions to higher temperatures are also possible. Ultrapure post-cleaning and packaging is optional.

Performance Features/Benefits

- Excellent thermal stability
- Excellent chemical resistance
- Excellent compression set resistance
- Good response to temperature cycling effects

Typical O-ring Compression Set Performance* (70 hr data)

Material Tested, % C/S at	Material Tested,		
	204°C	250°C	300°C
Kalrez [®] 4079	37	41	45
Competitive FFKM A2	43	100	Sample Failed

* ASTM D 395B and D 1414 (AS568 K214 O-ring test specimens)

Typical Physical Properties¹

Hardness Shore A, (pellet) ²	75
Hardness Shore M, (O-ring) ³	83
100% Modulus ⁴ , MPa	7.23
Tensile Strength at Break ⁴ , MPa	16.88
Elongation at Break ⁴ , %	150
Compression Set ⁵ , %	25
70 hr at 204°C, %	
Max Continuous Service Temperature ⁶ , °C	316

¹Not to be used for specification purposes

²ASTM D 2240 (pellet test specimens)

³ASTM D 2240 and ASTM D1414 (AS568 K214 O-ring test specimens)

⁴ASTM D 412 (dumbbell test specimens)

⁵ASTM D 395B (pellet test specimens)

⁶DuPont Performance Elastomers proprietary test method

Kalrez[®] Offers Excellent Resistance to Chemical Attack

For many applications, low volume swell of elastomers is critical for proper equipment operation. Excessive swell may cause permanent seal failure due to equipment hang-up, extrusion, etc. While other physical property testing may be needed to adequately define product performance in a particular application, volume swell is an excellent indicator of resistance to chemical attack. A summary of the internal and external compatibility tests performed to determine the volume swell of Kalrez[®] 4079UP in various semiconductor wet process environments is provided (*Table 2*).

Table 2 — Volume Swell¹, %

Immersion Chemistry	Exposure Conditions	Kalrez[®] 4079UP²
UPDI Water	85°C, 30 days	2.3
Piranha	25°C, 30 days	0.1
SC-1	25°C, 30 days	1.1
SC-2	25°C, 30 days	0.1
49% HF	25°C, 30 days	0.6
Sulfuric Acid	120°C, 30 days	0.8
Nitric Acid	85°C, 7 days	1.5
n-Methylpyrrolidone	85°C, 7 days	2.4

¹ The volume swell values above should be used as an approximate indicator of relative compatibility performance. Generally <10% volume swell is desirable.

² Testing performed on ultrapure-cleaned AS568 K214 O-ring test specimens.

For further information please contact one of the offices below, or visit our website at www.dupontelastomers.com/kalrez

Global Headquarters — Wilmington, DE USA

Tel. +1-800-853-5515
+1-302-792-4000
Fax +1-302-792-4450

European Headquarters — Geneva

Tel. +41-22-717-4000
Fax +41-22-717-4001

South & Central America Headquarters — Brazil

Tel. +55-11-4166-8978
Fax +55-11-4166-8989

Asia Pacific Headquarters — Singapore

Tel. +65-6275-9383
Fax +65-6275-9395

Japan Headquarters — Tokyo

Tel. +81-3-6402-6300
Fax +81-3-6402-6301

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