

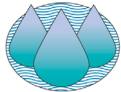


DuPont™ Kalrez®

Semiconductor Product Selector Guide

Technical Information—Rev. 15, July 2010

	Process Type	Typical Seal Temperature	Typical Process Environment	Suggested Products*	Comments	Typical Applications
 <p>Plasma Processes</p>	HDPCVD PECVD	25–200 °C	TMS, TEOS, SiH ₄ , NH ₃ , SiF ₄ , O ₂ , C ₂ F ₆ N ₂ O, NF ₃ , CF ₄ ,	9100 8002 8085	9100 —Translucent product for etching, deposition and “select” ashing/stripping processes.	Dynamic: <ul style="list-style-type: none"> • Door seals • Gate valves • Pendulum valves Static: <ul style="list-style-type: none"> • Chamber lid seals • Exhaust valves • Gas inlets/outlets • Window seals • Center rings Carrier: <ul style="list-style-type: none"> • Wafer/FPD Support/Transport
	Etching	25–200 °C	CF ₄ , C ₃ F ₈ , CHF ₃ SF ₆ , O ₂ , H ₂ , HBr, BCl ₃ , CCl ₄ , Cl ₂			
	Ashing/ Stripping	25–250 °C	O ₂ , CF ₄ , CHF ₃ , NH ₃ , H ₂ O Vapor Forming Gas	8002 9100 8085	8085—General purpose product for SACVD and all plasma processes.	
 <p>Thermal Processes</p>	SACVD	25–250 °C	TEP, TEBO, TEOS, O ₃ , NF ₃	8085 8002		
	Metal CVD ALD LPCVD	25–300 °C	Organic precursors, WF ₆ , TiCl ₄ , SiH ₄ , HF, F ₂ , Cl ₂ , ClF ₃ , NF ₃ , H ₂ O Vapor, O ₂ , O ₃	8900 9100	8900 —Black product for metal CVD, ALD, LPCVD, oxidation and diffusion thermal process applications	<ul style="list-style-type: none"> • Quartz chamber seal • Fittings • Center ring • Plenum seals
	Oxidation Diffusion	150–300 °C	N ₂ , O ₂ H ₂ O, HCl, Cl ₂	8900 8475	8475 —White product for lamp anneal and RTP thermal process applications	
	Lamp Anneal RTP	150–300 °C	Resistance to IR absorption	8475		
 <p>Wet Processes</p>	Wafer Prep	25–125 °C	UPDI, Piranha, SC-1, SC-2, O ₃ , HF (49%)	6375UP 4079	6375UP —Black product for all wet process applications	
	Etching	25–180 °C	HNO ₃ , HF, H ₂ O, H ₃ PO ₄ , HNO ₃ ,			4079—Excellent chemical resistance
	Photolithography	25–125 °C	H ₂ SO ₄ + Oxidant, Organic Acids, nMP			
	Stripping	25–125 °C	nMP/Alkanolamine Hydroxylamine	6375UP 1050LF	1050LF—Excellent amine resistance	
	Copper Plating	25–100 °C	CuSO ₄ Solution H ₂ SO ₄ , H ₂ O ₂	6375UP		

* For more detailed information, refer to “Chemical Compatibility Guide.” Products in **BOLD** are preferred.



The miracles of science™

DuPont™ Kalrez® Parts for the Semiconductor Industry

Kalrez® perfluoroelastomer parts have been used successfully in highly aggressive sealing environments for over 30 years. Kalrez® parts combine the resilience and sealing force characteristics of an elastomer with the chemical inertness and thermal stability of DuPont™ Teflon® fluoropolymer resin. DuPont offers molded O-rings and custom seals using a series of specialty products and ultrapure processing for the semiconductor industry. DuPont™ Kalrez® UltraPure™ parts have excellent chemical and thermal stability and have been specially formulated and processed to meet the unique requirements of wafer processing environments.

Chemical and Thermal Resistance

Kalrez® seals resist attack by over 1,800 chemicals including reactive gases and plasmas, alkalis, acids and solvents. Even in contact with these corrosive chemicals, Kalrez® seals retain their elastomeric properties at temperatures as high as 325 °C. DuPont has over 30 years experience in perfluoroelastomer research including polymer development, compounding, and parts manufacturing. As the sealing needs of the semiconductor industry have evolved, this experience has enabled DuPont to introduce new products that continue to increase seal life and reduce process contamination levels.

Ultrapure Processing Reduces Residual Contamination

Ultrapure post-cleaning and packaging is performed on Kalrez® parts as a secondary operation in a Class 100 clean room. Parts are cleaned using a proprietary process, followed by multiple rinses in UPDI water, and then dried under a filtered air stream. The parts are sealed in certified-clean, antistatic packaging material and shipped double-bagged, permitting easy clean room use by OEMs and fablines.

Ultrapure processing is standard for Kalrez® 9100, Kalrez® 8002, Kalrez® Sahara™ 8085, Kalrez® 8900, Kalrez® Sahara™ 8475, Kalrez® 6375UP and Kalrez® Sahara™ 8575. It is optional for Kalrez® 4079, Kalrez® 2037, and Kalrez® 1050LF. For these products, ultrapure processing can be specified by adding a “UP” suffix to the product designation (e.g., Kalrez® 4079UP).

Suggested Products for Semiconductor Use

DuPont™ Kalrez® 9100 is an amber translucent product targeted specifically for etching and deposition process applications, e.g., HDPCVD, PECVD and ALD. It has also exhibited excellent performance in “select” ashing/stripping processes. Kalrez® 9100 has been specifically designed for low erosion and ultra-low particle generation in harsh plasma environments. It offers excellent thermal stability, very low outgassing as well as excellent elastic recovery and mechanical strength properties and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 300 °C is suggested. Ultrapure post-cleaning and packaging is standard for all Kalrez® 9100 parts.

DuPont™ Kalrez® 8002 is a clear, transparent product targeted for ashing/stripping and “select” etching and deposition processes applications, e.g., SACVD. This unfilled product offers ultra-low particle generation in oxygen and fluorine-based plasmas versus mineral-filled products. Kalrez® 8002 exhibits excellent resistance to dry process chemistry, has good mechanical strength and is well suited for static, low stress/low sealing force and “select” bonded door seal applications. A maximum continuous service temperature of 275 °C is suggested. Ultrapure post-cleaning and packaging is standard for all Kalrez® 8002 parts.

DuPont™ Kalrez® Sahara™ 8085 is a beige, general purpose product for etching, ashing/stripping and deposition process applications, e.g., HDPCVD, PECVD and SACVD. It has been formulated for minimal particle generation in NF₃ plasma. Kalrez® Sahara™ 8085 exhibits very low particle generation and low weight loss in oxygen and fluorine-based plasma, has excellent mechanical strength and is well-suited for both static and dynamic sealing applications (e.g., bonded slit valve doors, bonded gate valves, bonded pendulum valves, gas orifice seals, gas feed-through seals, chamber lid seals). A maximum continuous service temperature of 240 °C is suggested. Kalrez® Sahara™ 8085 can also withstand short-term excursions to 275 °C. Ultrapure post-cleaning and packaging is standard for all Kalrez® Sahara™ 8085 parts.

DuPont™ Kalrez® 8900 is a black product that has been specifically developed for semiconductor thermal processes, e.g., oxidation, diffusion furnace, metal CVD, ALD and LPCVD. It offers outstanding thermal stability, very low outgassing and excellent (low) compression set properties. Kalrez® 8900 perfluoroelastomer parts exhibit excellent retention of physical properties at elevated temperatures, have excellent mechanical strength and are well-suited for both static and dynamic sealing applications. A maximum continuous service temperature of 325 °C is suggested. Short excursions to higher temperatures may also be possible. Ultrapure post-cleaning and packaging is standard for all Kalrez® 8900 parts.

DuPont™ Kalrez® Sahara™ 8475 has been specifically developed to meet the challenging requirements associated with sealing applications in semiconductor thermal processes (i.e., oxidation, diffusion furnace, LPCVD, RTP and lamp anneal). It exhibits excellent thermal stability and long-term sealing performance, less IR absorption and significantly reduced outgassing properties at elevated temperatures. Kalrez® Sahara™ 8475 has good mechanical properties and is well-suited for static and low stress/low sealing force applications (e.g., quartz tube seals, ball joint seals, bell jar seals, plenum seals). A maximum continuous service temperature of 300 °C is suggested. Ultrapure post-cleaning and packaging is standard for all Kalrez® Sahara™ 8475 parts.

DuPont™ Kalrez® 6375UP is a black product for all wet process applications. This product exhibits excellent chemical resistance to all different types of wet process chemicals including acids, bases and amine-base strippers. It features low elemental extractables with good mechanical and compression set properties and is well-suited for both static and dynamic wet process seal applications (e.g., filter seals, drain seals and flowmeters). A maximum continuous service temperature of 275 °C is suggested. Ultrapure post-cleaning and packaging is standard for Kalrez® 6375UP parts.

Additional Products Available

DuPont™ Kalrez® Sahara™ 8575 is a white product for “select” etching, ashing/stripping and deposition process applications. It offers lower weight loss in oxygen and fluorine-based plasmas, low outgassing and excellent elastic recovery properties. Kalrez® Sahara™ 8575 has excellent vacuum and long-term sealing performance, good mechanical properties and is well-suited for both static and dynamic sealing applications (e.g., gas inlets, chamber lid seals and slit valve door seals). A maximum continuous service temperature of 300 °C is suggested. Ultrapure post-cleaning and packaging is standard for all Kalrez® Sahara™ 8575 parts.

DuPont™ Kalrez® 4079 is a black, low compression set product 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 possible. Ultrapure post-cleaning and packaging is optional.

DuPont™ Kalrez® 2037 is a white product that is suitable for use in some plasma and gas deposition applications. It exhibits very low weight loss in oxygen and fluorine-based plasmas and has good mechanical strength properties. A maximum service temperature of 220 °C is suggested. Ultrapure post-cleaning and packaging is optional.

DuPont™ Kalrez® 1050LF is a black product for use in select semiconductor wet process applications where high concentrations of certain amines are present. It exhibits excellent amine resistance and has excellent thermal stability and mechanical strength properties. Kalrez® 1050LF is not recommended for use in organic or inorganic acids at elevated temperatures. A maximum continuous service temperature of 288 °C is suggested. Ultrapure post-cleaning and packaging is available. Please order this product as 1050UP when specifying ultrapure post-cleaning and packaging.

Semiconductor Product Information¹

Product	Color	Hardness Shore A (pellet) ²	Hardness Shore M (O-ring) ⁴	Max. Continuous Service Temp., ⁹ °C	100% Modulus ⁵ MPa	Compression Set ⁷ at 70 hr 204 °C, %
9100	Amber translucent	68 ¹¹	74	300	4.27 ¹⁰	17 ⁸
8002	Clear translucent	69 ³	76	275	2.88 ⁶	15 ⁸
8085	Beige	80	86	240	7.50	42 ⁸
8900	Black	73	80	325	10.73 ¹⁰	8 ⁸
8475	White	60	71	300	2.20	23 ⁸
6375UP	Black	75	83	275	7.23	25
8575	White	62	72	300	2.47	29
4079	Black	75	—	316	7.23	25
2037	White	79	—	220	6.20	27
1050LF	Black	82	—	288	12.40	35

¹ Not to be used for specification purposes

² ASTM D2240 (pellet test specimens unless otherwise noted)

³ JIS 6253 (plied slab test specimens)

⁴ ASTM D2240 and ASTM D1414 (AS568 K214 O-ring test specimens)

⁵ ASTM D412 (dumbbell test specimens unless otherwise noted)

⁶ JIS 6251 (dumbbell test specimens)

⁷ ASTM D395B (pellet test specimens unless otherwise noted)

⁸ ASTM D395B and ASTM D1414 (AS568 K214 O-ring test specimens)

⁹ DuPont proprietary test method

¹⁰ ASTM D412 and ASTM D1414 (AS568 K214 O-Ring test specimens)

¹¹ ASTM D2240 (plied slab test specimens)

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