



Kalrez[®] perfluoroelastomer parts

From DuPont Performance Elastomers

Ultrapure Post-Cleaning and Packaging Dramatically Reduces Particulate Contamination on the Surface of Kalrez[®] Parts

The post-cleaning process used by DuPont Performance Elastomers (DPE) for all finished Kalrez[®] UltraPure[™] (UP) parts yields part-cleanliness levels significantly superior to those obtained with processes used by other perfluoroelastomer parts suppliers to the semiconductor industry, according to comparative tests conducted recently by an independent third party.

Tests performed on various O-rings showed that Kalrez[®] UltraPure[™] parts cleaned with the DPE proprietary process exhibited significantly lower residual particle-contamination levels than semiconductor-grade O-rings from other suppliers—an average of 1.8 particles >1 $\mu\text{m}/\text{in}^2$ in size of O-ring surface area (see *Table 1*).

In addition, test results also showed a significant reduction in residual hydrocarbon contamination (mold-release residues, etc.) (see *Table 2*) present on part surfaces, as evidenced by Electron Spectroscopy for Chemical Analysis (ESCA).

In these tests, O-rings of corresponding sizes cleaned with competitive processes exhibited much higher average particle counts over the same micron size range: for O-rings cleaned with deionized water, an average of 19.3 particles >1 $\mu\text{m}/\text{in}^2$ in size of O-ring surface area; for O-rings cleaned with a solvent, an average of 25.1 particles >1 $\mu\text{m}/\text{in}^2$ in size of O-ring surface area. All the O-rings tested were cleaned and packaged in a clean room.

Table 1
Average Number of Particles per Square Inch of O-Ring Surface Area

Product*	Cleaning Process	No. of Particles >1 μm
Kalrez [®] UltraPure [™]	Proprietary	1.8
Competitive Perfluoroelastomer	Deionized Water	19.3
Competitive Perfluoroelastomer	Solvent	25.1

* All clean room packaged

Table 2
ESCA Analysis—Atom % Excluding Hydrogen

Product*	Fluorine	Carbon	Oxygen	Other
Kalrez [®] White UP	62.0	34.0	3.7	0.3
Kalrez [®] White	36.0	57.0	5.0	2.0
Kalrez [®] Black UP	63.0	33.0	3.6	0.4
Kalrez [®] Black	44.0	50.0	4.9	1.1
Theoretical*	66.0	33.0	1.0	—

* Ideal atom % for the surface area of cleaned Kalrez[®] parts.

The Kalrez® UltraPure™ Advantage

According to John Legare, senior sales engineer, DPE uses the Ultrapure process to ensure the highest degree of part cleanliness. "DuPont Performance Elastomers post-cleans all Kalrez® parts for semiconductor applications," Legare said. According to Legare, the proprietary post-cleaning process reduces the number of particles >1 µm in size present on part surface by a factor of 20. As an added benefit, residual hydrocarbon contamination present on the part surfaces is also reduced. Because DPE produces polymers, compounds and finished parts in-house, DPE has complete control over the entire supply chain. "DuPont Performance Elastomers is the only perfluoroelastomer parts supplier that offers customers this added advantage," Legare said.

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 airstream. For quality control, the parts are subjected to particle-count testing as a measure of surface cleanliness. Finally, the parts are sealed in certified-clean, antistatic packaging material and shipped double-bagged, permitting easy clean room use by OEMs and fablines. The inner bag is labeled to ensure full part traceability.

Kalrez® UltraPure™ Parts Availability

Ultrapure post-cleaning and packaging is standard for all Kalrez® semiconductor compounds. It is optional for Kalrez® 4079, Kalrez® 2037 and Kalrez® 1050LF. For these compounds, ultrapure post-cleaning and packaging can be specified by adding a "UP" suffix to the compound designation (e.g., Kalrez® 4079UP).

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