



**Kalrez**<sup>®</sup> perfluoroelastomer  
parts

From DuPont Performance Elastomers

# Introducing Kalrez<sup>®</sup> Perfluoroelastomer Parts For Photovoltaic Manufacturing Processes

Increase Uptime ...  
Increase Throughput ...  
Lower Cost of Ownership ...

As the demand for photovoltaic systems continues to rise, manufacturers must find ways to increase uptime and improve output. Frequently, more aggressive and efficient chemicals, and/or higher temperatures are employed to increase throughput; thereby putting more strain on the manufacturing infrastructure. Unplanned maintenance due to incompatible sealing materials can interfere with production schedules causing downtime. As a result, sealing materials in either wafer-based or thin film processes should have broad chemical compatibility and excellent thermal stability.

Kalrez<sup>®</sup> perfluoroelastomer parts have been field proven in highly aggressive sealing environments for more than 30 years. Kalrez<sup>®</sup> parts can help improve sealing reliability in photovoltaic processes that use high heat, aggressive chemicals and plasma. Kalrez<sup>®</sup> seals resist over 1,800 chemicals including reactive gases and plasmas, alkalis, acids and solvents. Even in contact with these corrosive chemicals, Kalrez<sup>®</sup> seals retain their elastomeric properties at temperatures as high as 325°C. On page 2 are the suggested Kalrez<sup>®</sup> products for use in the different photovoltaic manufacturing processes and also for poly-silicon feedstock production and abatement systems.



## Photovoltaic Product Selector Guide

### Silicon wafer-based cell manufacturing processes

<b>Surface Texturing</b> Kalrez® PV8030	<b>Doping</b> Kalrez® PV8070	<b>Edge Isolation</b> Kalrez® PV8050	<b>P Silicate Removal</b> Kalrez® PV8030	<b>ARC Coating</b> Kalrez® PV8050	<b>Metallization</b> Kalrez® PV8070	<b>Testing Sorting</b>
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Process Type	Typical Process Environment	Suggested Kalrez® Product
Surface Texturing	HF, HNO <sub>3</sub> , 80°C, Concentrated NaOH, KOH, IPA	PV8030
Doping	850-900°C, POCl <sub>3</sub> , In-Situ Cl <sub>2</sub> Cleaning	PV8070
Edge Isolation	CF <sub>4</sub> /O <sub>2</sub> Plasma	PV8050
P Silicate Removal	HF, HNO <sub>3</sub> , etc.	PV8030
ARC Coating (Batch Process)	SiH <sub>4</sub> , NH <sub>3</sub> Plasma, In-Situ NF <sub>3</sub> Plasma Cleaning	PV8050
Metallization	Annealing/Firing Process	PV8070

### Thin film cell manufacturing processes

<b>Back Contact</b>	<b>Patterning</b> Laser Scribing	<b>Cell Layer Deposition</b> See Below For Product	<b>Patterning</b> Laser Scribing	<b>TCO Deposition</b> See Below For Product	<b>Patterning</b> Laser Scribing	<b>Testing</b>
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\* Note - The order of the process steps can be different depending upon the module construction sequence.

Process Type	Typical Process Environment	Suggested Kalrez® Product
Cell Layer Deposition/Absorber <ul style="list-style-type: none"> <li>Amorphous/Micro-Crystalline Silicon</li> <li>CIS/CIGS</li> <li>Cadmium Telluride</li> </ul>	SiH <sub>4</sub> , H <sub>2</sub> Plasma, Remote NF <sub>3</sub> Plasma Cleaning	9100
TCO Deposition/Front Contact	Cu (In, Ga), Sputtering 500-550°C, H <sub>2</sub> Se, H <sub>2</sub> S Congruent Sublimation ZnO Sputtering Diethyl Zinc (DEZ) MOCVD	PV8050 PV8070 PV8050 PV8050 PV8030/PV8050

Other Process Types	Typical Process Environment	Suggested Kalrez® Product
Poly-Silicon Feedstock Production	TCS Deposition (1100°C, SiHCl <sub>3</sub> , HCl, H <sub>2</sub> )	PV8050
Wafer Sawing Damage Removal/Cleaning	HF, HNO <sub>3</sub> , 80°C Concentrated NaOH, KOH, IPA	PV8030
Abatement Systems ("Wet" Scrubbers)	Strong Acids/Bases	PV8030

## Suggested Products For Photovoltaic Use

### Kalrez® PV8030

Kalrez® PV8030 is a black product for sawing damage removal, wafer surface texturing, and P silicate removal. This product exhibits excellent resistance to aggressive chemicals including strong acids, bases and amines. It offers low extractables along with excellent compression set properties and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 275°C is suggested.

### Kalrez® PV8050

Kalrez® PV8050 is a white product for TCS-based thermal CVD for poly-silicon feedstock production, PECVD for Si<sub>3</sub>N<sub>4</sub> anti-reflective coating (bulk c-Si), and ZnO<sub>x</sub> deposition for back and front contacts (thin film). This product exhibits excellent resistance to oxygen and fluorine-based plasmas. It offers excellent vacuum and long-term sealing performance, good mechanical strength properties and is well suited for both static and select dynamic sealing applications. A maximum continuous service temperature of 300°C is suggested.

### Kalrez® PV8070

Kalrez® PV8070 is a black product for doping for n-type layer formation (bulk c-Si), diffusion for diselenide thermal implantation (CIGS). This product exhibits excellent thermal stability, compression set and low outgassing properties and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 325°C is suggested. Short excursion to higher temperatures may also be possible.

### Kalrez® 9100

Kalrez® 9100 is an amber translucent product for amorphous/microcrystalline silicon cell layer deposition processes. This product exhibits low erosion and ultra-low particle generation in aggressive plasma environments. It offers excellent thermal stability along with low outgassing properties and is well suited for both static and dynamic sealing applications. A maximum continuous service temperature of 300°C is suggested.

## Photovoltaic Product Information

### Typical Physical Properties<sup>1</sup>

Product	Color	Hardness <sup>2</sup> Shore M (O-ring)	Maximum Continuous Service Temperature <sup>3</sup> , °C	Compression Set, 70 Hrs. @ 204°C, %
Kalrez® PV8030	Black	83	275	30 <sup>4</sup>
Kalrez® PV8050	White	72	300	17 <sup>4</sup>
Kalrez® PV8070	Black	83	325	14 <sup>4</sup>
Kalrez® 9100	Amber Translucent	74	300	17 <sup>4</sup>

<sup>1</sup> Not to be used for specification purposes

<sup>2</sup> ASTM D2240 & D1414 (AS568 K214 O-ring test specimens)

<sup>3</sup> DuPont Performance Elastomers proprietary test method

<sup>4</sup> ASTM D395B & D1414 (AS568 K214 O-ring test specimens)

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For further information please contact one of the offices below, or visit our website at [www.dupontelastomers.com/kalrez](http://www.dupontelastomers.com/kalrez)

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