DuPont Kalrez® Perfluoroelastomer (FFKM) parts provide best in class chemical resistance, outstanding thermal & steam resistance and low contamination from extractables for demanding applications in pharmaceutical, life science and food handling where FDA compliance is required.

Kalrez® parts deliver longer seal life versus lower performing elastomers thereby improving productivity, efficiency and cleanliness. They also help to create a safer environment for medical packaging, disposable device handling and in the day to day running of pharmaceutical manufacturing facilities.

**Product Selector**

The following guide provides a quick and easy tool for the selection of Kalrez® products for the Life Sciences Industry.

<table>
<thead>
<tr>
<th>Kalrez® 6230</th>
<th>Kalrez® 6221</th>
<th>Kalrez® LS205</th>
<th>Kalrez® LS390</th>
<th>Kalrez® LS222</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available geometries</td>
<td>O-rings &amp; Specialty Shapes</td>
<td>O-rings</td>
<td>Specialty Shapes &amp; O-rings</td>
<td>Hygienic couplings</td>
</tr>
<tr>
<td>Color</td>
<td>Black</td>
<td>White</td>
<td>White</td>
<td>Grey</td>
</tr>
</tbody>
</table>

**APPLICATIONS**

- Rotating equipment (mixers, pumps, centrifuges, etc.)
- Filtration and Drying
- Piping
- Flow regulation (valves)
- WFI (water for injection)
- Medical packaging

**CERTIFICATIONS**

- US FDA
- USP <87> & <88> Class VI @ 121°C
- 3-A
- Japan Pharmacopeia
- EC 1935/2004

Please Contact DuPont for Additional Information

* Please consult a Kalrez® Application Engineer to assess perform fit for your specific application.
**Typical Physical Properties¹**

<table>
<thead>
<tr>
<th></th>
<th>Kalrez® 6230</th>
<th>Kalrez® 6221</th>
<th>Kalrez® LS205</th>
<th>Kalrez® LS390</th>
<th>Kalrez® LS222</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Application</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong>², °C (°F)</td>
<td>260 (500)</td>
<td>260 (500)</td>
<td>225 (437)</td>
<td>220 (428)</td>
<td>225 (437)</td>
</tr>
<tr>
<td><strong>Hardness³, Shore A</strong></td>
<td>75</td>
<td>70</td>
<td>75</td>
<td>88</td>
<td>75</td>
</tr>
<tr>
<td><strong>100% Modulus⁴, MPa, (psi)</strong></td>
<td>7.03 (1020)</td>
<td>7.24 (1050)</td>
<td>7.57 (1099)</td>
<td>11.16 (1618)</td>
<td>6.95 (1008)</td>
</tr>
<tr>
<td><strong>Tensile Strength @ Break⁴, MPa, (psi)</strong></td>
<td>16.54 (2400)</td>
<td>15.16 (2200)</td>
<td>21.11 (3062)</td>
<td>18.60 (2699)</td>
<td>17.39 (2522)</td>
</tr>
<tr>
<td><strong>Elongation @ Break⁴, %</strong></td>
<td>170</td>
<td>150</td>
<td>170</td>
<td>147</td>
<td>170</td>
</tr>
<tr>
<td><strong>Compression Set⁵, Pellet, 70 hrs. @ 204°C, %</strong></td>
<td>24</td>
<td>27</td>
<td>21</td>
<td>30 (-214 O-ring)</td>
<td>21</td>
</tr>
</tbody>
</table>

¹ Not to be used for specification purposes  
² DuPont proprietary test method  
³ ASTM D2240 (pellet test specimens)  
⁴ ASTM D412 (dumbbell test specimens)  
⁵ ASTM D395B (pellet test specimens unless otherwise noted)

**Product Description**

**Kalrez® 6230**
DuPont™ Kalrez® 6230 perfluoroelastomer parts are compliant with the United States’ Food and Drug Administration’s regulations for repeated use in contact with food as described by 21 CFR177.2600 and Food Contact Notification 000101. Kalrez® parts made from compound 6230 have been tested in accordance with the United States Pharmacopoeia Class VI (USP Class VI) testing protocol and meet the test requirements of a USP Class VI polymer. This is a black product that offers excellent steam cycling resistance and reduces extractables from sealing materials to trace levels.

**Kalrez® 6221**
DuPont™ Kalrez® 6221 perfluoroelastomer parts are compliant with the United States’ Food and Drug Administration’s regulations for repeated use in contact with food as described by 21 CFR177.2600 and Food Contact Notification 000101. Kalrez® parts made from compound 6221 have been tested in accordance with the United States Pharmacopoeia Class VI (USP Class VI) testing protocol and meet the test requirements of a USP Class VI polymer. This is a white product that offers excellent steam cycling resistance and reduces extractables from sealing materials to trace levels. It is only available in O-ring form; custom geometries are not available.

**Kalrez® LS205**
DuPont™ Kalrez® LS205 perfluoroelastomer parts are a white product for use in food handling and pharmaceutical applications where FDA and/or USP <87> and <88> Class VI compliance are required. Kalrez® LS205 parts provide superior chemical resistance and low extractables in demanding applications. This product is also well suited for custom parts and other non-O-ring applications. A maximum application temperature of 225°C (437°F) is suggested.

**Kalrez® LS390**
DuPont™ Kalrez® LS390 perfluoroelastomer parts are a grey product for use as sanitary seals in food handling, beverage, and pharmaceutical applications where FDA, USP <87> and <88> Class VI compliance are required. In addition, Kalrez® LS390 parts also meet Japan Pharmacopoeia, edition 16*. LS390 parts provide excellent chemical resistance to process chemicals, WFI (water for injection), as well as SIP and/or CIP processes, which helps increase MTBR (Mean Time Between Repair). LS390 sanitary seals have demonstrated low stick properties and high hardness/modulus to make LS390 parts an excellent choice for sanitary seal applications. These properties also facilitate sanitary seal piping disassembly. Because of its unique grey color, LS390 parts are easy to identify for proper material selection and application. A maximum application temperature of 220°C (428°F) is suggested.
Kalrez® LS222
DuPont™ Kalrez® LS222 perfluoroelastomer parts are black product that has been specifically developed for use in high volume medical packaging and disposable devices (e.g., micro-valves, aerosol rings, needle covers, serum stoppers, plungers, infusion hangers, etc.). This exciting new development represents an expansion of the Kalrez product line to meet the demand from OEMs and Life Science Manufacturers who require large quantities (more than 10,000 parts per order // minimum of 500 pieces packaged per bag) of high quality parts. A wide range of dimensions and shapes are offered: from small (OD up to 25.4mm) to medium (OD up to 50.8mm) size O-rings as well as select custom shapes/parts.

Application Success Stories

Listed below are several application success stories with Kalrez® Life Sciences Products. Additional application success stories are available upon request. Please contact a Kalrez® Application Engineer for more information.

Kalrez® 6230

Application: Steam Generator

Equipment: Device used to create steam by applying heat energy to water at low to medium pressure (0 to 20 bars) and at a working temperature between 130°C and 140°C

Challenge: Resistance to steam at high temperature as well as various cleaning procedures

Solution: In testing conducted by customers in the presence of saturated steam at 4 bars and 140°C, Kalrez® 6230 lasted 500,000 cycles; Competitive FFKM Materials and EPDM failed after 100,000 cycles.
Kalrez® LS390

Customer: Major Japanese Pharmaceutical Manufacturer

Customer is the one of the largest infusion drop product manufacturers in Japan. They were interested in Kalrez® LS390’s improved chemical compatibility and low stiction properties. They agreed to run the initial evaluation in their pure stream line.

Process: Pure Steam (SIP) for Infusion Drop Production Process

Temperature: <140°C

Pressure: <0.4MPa

Evaluation Period: August 2014 through August 2015

Incumbent Seal: Silicone Rubber

Performance Issues w/Incumbent Seal: Poor steam resistance and high “stiction” (sticking) resulted in a more frequent maintenance cycle.

Kalrez® LS390 Performance: Kalrez®LS390 Sanitary Seals lasted for 1 year without any reported performance issues.

Visit us at kalrez.dupont.com or vespel.dupont.com

Contact DuPont at the following regional locations:

<table>
<thead>
<tr>
<th>Region</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>800-222-8377</td>
</tr>
<tr>
<td>Latin America</td>
<td>+0800 17 17 15</td>
</tr>
<tr>
<td>Europe, Middle East, Africa</td>
<td>+41 22 717 51 11</td>
</tr>
<tr>
<td>Greater China</td>
<td>+86-400-8851-888</td>
</tr>
<tr>
<td>Japan</td>
<td>+81-3-5521-8484</td>
</tr>
</tbody>
</table>

The information set forth herein is furnished free of charge and is based on technical data that DuPont believes to be reliable and falls within the normal range of properties. It is intended for use by persons having technical skill, at their own discretion and risk. This data should not be used to establish specification limits nor used alone as the basis of design. Handling precaution information is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Since conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any product, evaluation under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on patents.

Caution: Do not use DuPont materials in medical applications involving implantation in the human body or contact with internal body fluids or tissues unless the material has been provided from DuPont under a written contract that is consistent with DuPont policy regarding medical applications and expressly acknowledges the contemplated use. For further information, please contact your DuPont representative. You may also request a copy of DuPont POLICY Regarding Medical Applications and DuPont CAUTION Regarding Medical Applications.

Copyright © 2012 DuPont. The DuPont Oval Logo, DuPont™, The miracles of science™, Kalrez®, and Vespel® are trademarks or registered trademarks of E.I. du Pont de Nemours and Company or its affiliates. All rights reserved.

(8/16) Reference No. KZE-A40040-00-A0916