



DuPont™ Kalrez® 0090

Provides Outstanding Resistance to Rapid Gas Decompression

Technical Information - Rev. 5, July 2019

Product Description

DuPont™ Kalrez® 0090 perfluoroelastomer parts deliver durable, reliable sealing solutions for applications requiring excellent rapid gas decompression (RGD) properties as well as high hardness, high modulus properties, and excellent extrusion resistance (even without backup rings). Potential oil and gas applications include downhole equipment such as drilling and completion tools, as well as industrial equipment including pumps, valves and compressors. Kalrez® 0090 has been certified by two independent laboratories to meet rigorous requirements for resistance to RGD.

In addition to demonstrated RGD resistance, DuPont™ Kalrez® 0090 seals provide superior performance in regard to chemical and temperature properties.

- Chemical resistance: Kalrez® 0090 is resistant to chemicals encountered in the oil and gas industry, including sour process streams containing H₂S. (Reference NORSOK M-710 Rev 2 Sour Fluid aging resistance performed by MERL (UK).
- Broad temperature capability: Kalrez® 0090 retains good physical properties up to temperatures as high as 250 °C (482 °F) and down to -21 °C (-5.8 °F). Under pressurized conditions, in laboratory tests*, Kalrez® 0090 has demonstrated low temperature performance down to -40 °C (-40 °F).

Typical Physical Properties¹

Color	Black
Hardness, Durometer Shore A ²	95
50% Modulus ³ , MPa (psi)	14.18 (2057)
Tensile Strength at Break ³ , MPa (psi)	19.49 (2827)
Elongation at Break ³ , %	80
Compression Set ⁴ , %70 hrs.at 204 °C (400 °F)	19
Compression Set ⁵ , %70 hrs.at 204 °C (400 °F)	33
Maximum Service Temperature ⁶ , °C (°F)	250 (482)
Lowest Service Temperature ⁶ , °C (°F)	-21 (-5.8)
Tg ⁷ , °C (°F)	-1 (30.2)
Tr10 ⁸ , °C (°F)	-7.4 (18.68)

* MERL Oilfield Engineering with Polymers — Matoux 24 Oct 2012.

¹ Not to be used for specifications

² ASTM D2240 (Pellet test specimens)

³ ASTM D412 (Dumbbell test specimens)

⁴ ASTM D395B, (Pellet test specimens)

⁵ ASTM D395B & D1414, (AS568 K214 O-ring test specimens)

⁶ DuPont proprietary test method; performance will vary with seal design and application specifics

⁷ DuPont proprietary test method (DSC midpoint)

⁸ ASTM D1329 (ISO 2781) (slab test specimens)



Product Testing Notes

- Every product delivery comes with a COA (Certificate of Analysis) that contains the information required as per ISO 23936-2.
- The tear strength result reported in is a “typical physical property.” This result is representative of this particular test, but may not be related to actual field performance. End use testing will be required to determine product suitability for use.
- High pressure gas permeation data is required for large components and depends on the part geometry. The data can be generated once testing conditions have been agreed with the customer.

Certifications

Compliant with ISO 23936-2

Tested by Materials Engineering Research Laboratory (MERL) against NORSOK M-710 rev.2 for both

- Annex B: Rapid Gas decompression, Kalrez® 0090 was given the highest rating, “0”, indicating “no internal cracks, holes or blisters of any size.” (O-ring size AS568-312) (See Table 2 conditions)
- Annex A: Sour gas chemical aging
- Required documentation of material properties is provided below in accordance to Table 1 of the ISO23936-3 standard

Certified as per TOTAL GS PVV 142

Tested by CETM (Technical Center for industry testing) against TOTAL GS PVV 142 Rapid Gas Decompression requirements

- Pass with no cracks, no blisters on CSD = 5.33 mm (O-ring size AS568-349) (See Table 2 conditions)
- Pass with no cracks, no blisters on CSD = 6.99 mm (O-ring size AS568-425) (See Table 2 conditions)

Highest NORSOK and TOTAL Rating Demonstrates Outstanding RGD Resistance of DuPont™ Kalrez® 0090

	NORSOK M-710 (Rev. 2) Certified	TOTAL GS EP PVV 142 (Rev. 5) Qualified
Rating	No internal cracks, holes, or blisters	No internal cracks, holes, or blisters
Test conditions		
Gas	90/10 mol% CH ₄ /CO ₂	80/20 mol% CH ₄ /CO ₂
Temperature	100 °C (212 °F)	75 °C ±2 °C (167 °F ± 3.6 °F)
Pressure gradient	15 MPa (~2200 psi)* to ambient	19 MPa (~2756 psi)* to ambient
Decompression rate	2 MPa/min	12.67 MPa/min
Cycling	10 cycles, one every 24 h	5 cycles
Sample details		
Size	AS568 size 312	AS568 size 349, and size 425
Cross Section diameter	5.33 mm, nominal (size 312)	5.33 mm, nominal (size 349); 6.99 mm nominal (size 425)
Groove fill	67%, nominal	73%, nominal

*Initial pressure maintained for at least 72 hrs. prior to testing

NORSOK M-710 (Rev. 2)

TEST CERTIFICATE	
<p>This document certifies that</p> <p>Kalrez(r) 0090 – K312 "A" O-rings from</p> <p>DuPont Performance Polymers</p> <p>meet the requirements of</p> <p>NORSOK M710 [Rev. 2, October 2001] in respect of rapid gas decompression resistance in 10% carbon dioxide at 150 bar and 100°C</p>	
<p>Test gas: 90/10 mol% CH₄/ CO₂</p> <p>Test temperature: 100°C</p> <p>Test pressure: 150 bar</p> <p>Decompression rate: 20 bar/minute</p>	
<p>Passed by: Dr Sabine Munch</p> <p>Date of first issue: 15/10/2009</p> <p>Date of last revision: 16/08/2012</p>	
<p>MATERIALS ENGINEERING RESEARCH LABORATORY LTD</p> <p>Wilbury Way, Hitchin, Hertfordshire, SG4 0TW, United Kingdom. T: +44 (0) 1462 427850 F: +44 (0) 1462 427851</p> <p>enquiries@merl-lltd.co.uk www.merl-lltd.co.uk</p>	

TOTAL GS EP PVV 142 (Rev. 5)

N°Réf : 2011/081/AT/SPAS/NFOU	
TEST REPORT* Rapid Gas Decompression Test According to Total GS EP PVV 142 rev. 5 Procedure	
N : CET0073407/6J1/b	Date : 11 January 2012
Attention to :	DUPONT DE NEMOURS INTERNATIONAL SARL 2 CHEMIN DU PAVILLON PO BOX 50 1218 LE GRAND SACONNEX SUISSE
Reference of request : Order n°DP1592661	
Specimen supplied by customer : 6 O-rings DuPont™ Kalrez® 0090: 113,67 x 5,33mm	
<p>1. Aim and definition of test :</p> <p>These tests, performed at the CETIM of Nantes in November 2011, aim at testing the elastomer seal resistance to rapid gas decompression or explosion decompression. The procedure is TOTAL, General Specification GS EP PVV 142 Rev 05 concerning O-rings used in industrial valve industry.</p>	
<p>2. Component tested :</p> <p><i>Elastomer Material :</i></p> <ul style="list-style-type: none"> • Manufacturer : DuPont de Nemours • Reference : K#349 / compound: Kalrez® 0090 • Batch number : 10114507070 • Production period : 10/06/2011 <p>Kalrez® is a registered trademark of E.I. DuPont de Nemours and Company or its affiliates.</p> <p><i>O-ring nominal dimensions :</i></p> <ul style="list-style-type: none"> • Cross-section : 113,67 mm • Internal diameter : 5,33 mm 	
<p>3. Test conditions :</p> <ul style="list-style-type: none"> • Fluid : 80 % CH₄, 20 % CO₂ • Temperature : 75°C ± 2 °C • Decompression rate : 190 to 0 bar in 90 s (linear decompression) • Soaking times : 72 h and 4 times 48 h • Nominal groove fill : 73 % • Actual groove fill : 72,6 % • Pressure : 190 bar ± 2 bar • Number of decompression : 5 • Dwell time : 1 h • Nominal axial compression : 13,7 % • Actual axial compression : 13,9 % 	
<p>4. Test result :</p> <ul style="list-style-type: none"> • No visible crack on the external surface of three O-rings tested simultaneously. • The highest Norsok rating of the observed cross sections (M710 rev. 02/10/01) is 0000. 	
<p>5. Conclusion :</p> <p>This material fulfills the acceptance criterion of the GS EP PVV 142 Rev. 5. All the results and procedure detail are given in the detailed test report number CET0073407/6J1/am.</p>	
<p>In charge of test Steven PASQUEREAU</p>	<p>Technical Contact Emmanuel SAUGER</p>
<p>* This document is a test report and does not constitute a certificate of conformity (Articles L115-27 to L115-29 of the Code of the Consumption).</p> <p>Any partial reproduction could distort the contents of this document, whether an omission, alteration or adaptation, involves the responsibility of the customer with respect to the Cetim as well as third parties.</p>	
<p><small>Siège social / Headquarters 52, avenue Félix-Louat - B.P. 80067 - F-60304 Senlis Cedex Tél. + 33 3 44 67 30 00 Fax + 33 3 44 67 34 00 Centre Technique, régi par les articles L342.1 & L342.15 du Code de la Recherche N°Siret 75829074 Code APE 7219Z</small></p>	

Visit us at kalrez.com

dupont.com



The information set forth herein is furnished free of charge, is based on technical data that DuPont believes to be reliable, and represents typical values that fall within the normal range of properties. This information relates only to the specific material designated and may not be valid for such material used in combination with other materials or in other processes. It is intended for use by persons having technical skill, at their own discretion and risk. This information 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 and comply with applicable law. 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 the DuPont policy regarding medical applications and expressly acknowledges the contemplated use. For further information, please contact your DuPont representative.

DuPont's sole warranty is that our products will meet our standard sales specifications in effect at the time of shipment. Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted. TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, DUPONT SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR NON-INFRINGEMENT. DUPONT DISCLAIMS LIABILITY FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

DuPont™, the DuPont Oval Logo, and all trademarks and service marks denoted with ™, SM or ® are owned by affiliates of DuPont de Nemours, Inc. unless otherwise noted.

© 2019 DuPont. All rights reserved.