

DuPont™ Kalrez® 0090 perfluoroelastomer parts

Provides Outstanding Resistance to
Rapid Gas Decompression

Technical Information — Rev. 3, September 2012

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 and high modulus properties. Some application areas include downhole equipment such as drilling and completion tools as well as industrial equipment including pumps and valves. Kalrez® 0090 has been certified by two independent labs (see Table 2) to meet rigorous requirements for resistance to RGD.

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

- Chemical resistance: Kalrez® parts withstand attack by more than 1800 chemical substances. Kalrez® 0090 can be resistant to sour multi-phase fluids containing H₂S as shown by the external NORSOK M-710 Rev 2 Sour Fluid ageing resistance certification provided by MERL (UK).
- Broad temperature capability: Kalrez® 0090 retains high levels of resilience up to temperatures as high as 250 °C (482 °F) and down to -21 °C (-5.8 °F). Under pressurized sealing conditions, Kalrez® 0090 has demonstrated low temperature performance down to -40 °C (-40 °F) in customer laboratory tests*.

* MERL presentation—Matoux 24 Oct 2012.

Table 1. Typical Physical Properties¹

Color	Black
Hardness ² , Durometer Shore A	95
50% Modulus ³ , MPa (psi)	14.18 (2057)
Tensile Strength at Break ³ , %	19.49 (2827)
Elongation at Break ³ , %	80
Compression Set—O-rings ⁴ , 70 hr at 200 °C (392 °F), %	33
Compression Set—Pellets ⁴ , 70 hr at 200 °C (392 °F), %	19
Compression Set in Nitrogen ⁴ —O-ring, 336 hr at 250 °C, %	35
Upper Service Temperature ⁵ , °C (°F)	250 (482)
Lower Service Temperature ⁶ , °C (°F)	-21 (-5.8)
Tg ⁶ , °C (°F)	-1 (30.2)
Tr10 ⁷ , °C (°F)	-7.4 (18.68)
Volume Swell ⁸ , % change	
Steam, 225 °C (437 °F), 672 hr	<5
Ethylendiamine, 90 °C (194 °F), 672 hr	<5
H ₂ S/CO ₂ (65%/35%), 220 °C (428 °F), 672 hr	<5

¹ Not to be used for specification purposes

² ASTM D2240 (pellet test specimens)

³ ASTM D412, (AS568 K214 O-ring test specimens)

⁴ ASTM D395B

⁵ DuPont proprietary test method (anaerobic conditions)

⁶ DuPont proprietary test method

⁷ ASTM D1329 (slab test specimens)

⁸ ASTM D471 (AS568 K214 O-ring test specimens)




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Table 2. 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	BS 1806 size 312	BS 1806 size 349
Section diameter	5.33 mm, nominal	5.33 mm, nominal
Groove fill	67%, nominal	73%, nominal

*Initial pressure maintained for at least 72 h prior to testing

NORSOK M-710 (Rev. 2) Certificate



TEST CERTIFICATE

materials engineering research laboratory

This document certifies that
Kalrez(r) 0090 – K312 "A" O-rings from
DuPont Performance Polymers
meet the requirements of
NORSOK M710 [Rev. 2, October 2001] in respect of rapid gas decompression resistance in 10% carbon dioxide at 150 bar and 100°C

Test gas: 90/10 mol% CH₄/CO₂
Test temperature: 100°C
Test pressure: 150 bar
Decompression rate: 20 bar/minute

Passed by: Dr. Sabine Munch
Date of first issue: 15/10/2009
Date of last revision: 16/08/2012

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TOTAL GS EP PVV 142 (Rev. 5) Qualification



TEST REPORT*
Rapid Gas Decompression Test According to
Total GS EP PVV 142 rev. 5 Procedure

N: CET00734076J1h Date: 11 January 2012
Attention to: DUPONT DE NEMOURS INTERNATIONAL SARL
2 CHEMIN DU PAVILLON
PO BOX 98
1218 LE GRAND-SACCONNES SUISSE
Reference of request: Order n°DP1592661
Specimen supplied by customer:
6 O-rings DuPont™ Kalrez® 0090-113,67 x 5,33mm

1. Aim and definition of test:
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.

2. Component tested:
Elastomer Material:
• Manufacturer: DuPont de Nemours
• Reference: K312 compound: Kalrez® 0090
• Batch number: 1011459707
• Production period: 10/06/2011
• Country: USA
Kalrez® is a registered trademark of E.I. DuPont de Nemours and Company or its affiliates.
O-ring nominal dimensions:
• Cross-section: 113,67 mm
• Internal diameter: 5,33 mm

3. Test conditions:
• 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%

4. Test results:
• 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.

5. Conclusion:
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 CET00734076J1h.

In charge of test: Steven PASQUETREAU
Technical Contact: Emmanuel SAIGIER

* This document is a test report and does not constitute a certificate of conformity (Articles L.113-27 to L.113-3) of the Code of the Consumption.
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