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## TEST CERTIFICATE

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This document certifies that the material denoted

**J9523**

from

**TRELLEBORG SEALING SOLUTIONS**

meets the requirements of

**NORSOK M-710 Rev. 2 in respect of sour fluid resistance**

Test fluid: 2% hydrogen sulphide/hydrocarbon oil/water

Test pressure: 90-110 bar

Passed by: Barry Thomson

Date: 22<sup>nd</sup> November 2013

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Element verify that tensile specimens of perfluoroelastomer grade J9523 (batch 95230002) supplied by TRELLEBORG SEALING SOLUTIONS have been exposed in a multi-phase sour fluid at three elevated temperatures.

### EXPOSURE FLUID COMPOSITION AND DISTRIBUTION

FLUID	CELL VOLUME OCCUPANCY (%)
2/3/95 mol% H <sub>2</sub> S/CO <sub>2</sub> /CH <sub>4</sub>	30
70/20/10 volume% heptane/cyclohexane/toluene	60
Distilled water	10

The tensile testpieces were located in the hydrocarbon oil phase for each exposure test. Test temperatures and sampling intervals used in the NORSOK M-710<sup>1</sup> programme are tabulated below.

TEMPERATURE (°C)	SAMPLING INTERVALS (days)
170	7, 14, 28, 49
185	6, 14, 25, 45
200	5, 10, 20, 35

### J9523 PERFORMANCE SUMMARY

Swell <sup>1</sup>	50% modulus <sup>2</sup>	Tensile strength <sup>2</sup>	Elongation at break <sup>2</sup>	Hardness <sup>3</sup>	NORSOK acceptable
PASS	PASS	PASS	PASS	PASS	YES

<sup>1</sup> Acceptable range is -5% to +25%

<sup>2</sup> Changes within ±50% range, from as-received level

<sup>3</sup> Acceptable range is -20 to +5 units

J9523 swelled moderately (8-15%) early in each exposure test and this reduced the level of 50% modulus and tensile strength; elongation at break increased. The level of 50% modulus was then insensitive to additional exposure time at each temperature, the expected behavior for a material resistant to chemical ageing. Tensile break property levels were adversely affected in a small number of cases by the presence blisters, believed to be due to rapid gas decompression [RGD] effects.

For 50% modulus, the average reduction across all exposure conditions was 52%. Although this is outside the “baseline” lower limit of -50%, the magnitude of the “breach” is not considered significant. Despite the presence of RGD damage in many tensile specimens, overall mean changes in tensile strength and elongation at break were -43% and +18%, respectively. In only three instances did the change in tensile strength exceed the baseline lower boundary; in each case, RGD damage was implicated in the premature breaking of the testpiece. There was no evidence to suggest that J9523 had been chemically aged.

Hence J9523 is considered to meet the requirements of the NORSOK M-710 Rev. 2 standard for sour fluid exposure.

<sup>1</sup> NORSOK M-710, “Qualification of non-metallic sealing materials and manufacturers”, Rev. 2, October 2001.

**O-rings in compound J9523, supplied by  
Trelleborg Sealing Solutions**

have been tested according to the requirements of

**NORSOK M-710 Edition3: 2014 and BS EN ISO 23936-2  
[ISO23936-2:2011(E)]  
(Rapid gas decompression resistance)**

**PASSED**

Test gas:	90/10 mol% CH <sub>4</sub> / CO <sub>2</sub>
Test temperature:	100 ±2 °C
Test pressure:	150 bar (15 MPa)
Number of cycles:	8
Decompression rate:	20 bar/minute
Seal Size:	312 (ISO 3601-1/AS 568)

Helen Coates  
Scientist

24<sup>th</sup> August 2015  
Date

Element Hitchin has been assessed to BS EN ISO 9001 by the British Standards Institution (BSI) and is a registered firm under the BSI Quality Assurance scheme for the provision of professional and technical services.



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Element Hitchin verify that O-rings in compound **J9523** supplied by Trelleborg Sealing Solutions have been subjected to a multi-cycle RGD test under the conditions detailed below.

**RGD TEST COMMISSIONED BY**

Trelleborg Sealing Solutions

**SEAL COMPOUND DETAILS**

Seal Manufacture	Trelleborg Sealing Solutions	
Supplied by	Trelleborg Sealing Solutions	
Compound name/number/reference	J9523	
Elastomer type to ASTM D1418	FFKM	
Lot/Batch No.	B/N 9523008	
Seal type	O-ring	
Manufacturing method	Not disclosed	
Seal size (ISO3601-1/AS 568)	312	
CSD (nominal)	mm	5.33
Mean CSD (actual, radial)	mm	5.33

**RGD TEST CONDITIONS**

Temperature	°C	100±2
Pressure	MPa (bar)	15 +1/-0.5 (150 +10/-5)
No. of cycles		8
Dwell between cycles	hour	1
Decompression rate (average)	MPa/min (bar/minute)	2 (20)
Gas type	mol%	90/10 CH <sub>4</sub> /CO <sub>2</sub>

**SEAL HOUSING DETAILS CONDITIONS**

Seal compression direction	Radial	
Groove ID	mm	25.36
Groove OD	mm	16.00
Groove width	mm	5.68
Squeeze (average)	%	12.10
Groove fill (area basis)	%	84
Number of seals tested	4	

**ISO TEST SEAL RATINGS**

SEAL REPLICATE	RATING	PASS/FAIL
1	3200	Pass
2	2000	Pass
3	0000	Pass
4	0000	Pass

**OVERALL RATING**

PASS

**GENERAL**

Test laboratory	Element Materials Technology, Hitchin, U.K.	
Test date	24 <sup>th</sup> July 2015 to 3 <sup>rd</sup> August 2015	
Test gas certified and available	YES/NO	YES
Transducer calibration available	YES/NO	YES
P/T log available	YES/NO	YES

TEST LABORATORY STAMP/SIGNATURE



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