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## TEST CERTIFICATE

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This document certifies that

**FKM compound Endura® V91A**

from

**PRECISION POLYMER ENGINEERING LTD.**

meets the requirements of

**NORSOK M-710 in respect of sour fluid resistance**

Test fluid:	<u>2% hydrogen sulphide/hydrocarbon oil/water</u>
Test pressure:	<u>100 bar (10 MPa)</u>
Passed by:	<u>Barry Thomson</u>
Date:	<u>30<sup>th</sup> April 2015</u>

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Element verify that specimens of the FKM compound Endura<sup>®</sup> V91A have been subjected to a series of sour multi-phase fluid exposures at three elevated temperatures.

### **Test Conditions**

<b>Exposure fluid composition and distribution</b>	
<b>VOLUME (%)</b>	<b>COMPOSITION</b>
30	2/3/95 mol% H <sub>2</sub> S/CO <sub>2</sub> /CH <sub>4</sub>
10	Distilled water
60	70% heptane, 20% cyclohexane, 10% toluene

The tensile testpieces were placed in the hydrocarbon oil phase for the exposure tests.

Test temperatures and exposure periods used in the NORSOK M-710 programme are shown in the table below; test pressure was 100 bar.

<b>Exposure test conditions</b>	
<b>TEMPERATURE (°C)</b>	<b>SAMPLING INTERVALS (days)</b>
121	7, 14, 28, 35, 42, 50
150	7, 14, 28, 42, 56
175	7, 14, 28, 40, 54

### **Summary for Endura<sup>®</sup> V91A**

<b>TYPE</b>	<b>Swell<sup>1</sup></b>	<b>50/100% modulus<sup>2</sup></b>	<b>Tensile strength<sup>2</sup></b>	<b>Elongation at break<sup>2</sup></b>	<b>NORSOK acceptable</b>
FKM	PASS	PASS	PASS	PASS	YES

<sup>1</sup> <25% over 42 days; 30% at 50 days due to blistering

<sup>2</sup> changes within ±50% range, from oil-soaked level

FKM grade V91A behaves as expected when immersed in a liquid hydrocarbon oil with H<sub>2</sub>S present. Swelling is moderate and tensile property levels do not show evidence of chemical ageing having occurred. The tensile data do not exhibit trends that discriminate between the influence of exposure time and temperature, excluding their use in life estimation calculations. The changes in room temperature tensile property levels are within the allowable range after exposure periods at 121-175 °C of up to 8 weeks.

FKM grade Endura<sup>®</sup> V91A meets the requirements of the NORSOK M-710 standard for sour fluid exposure.