

---

## TEST CERTIFICATE

---

This document certifies that

**V91K**

from

**Precision Polymer Engineering Limited (PPE)**

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: 100 bar (10 MPa)

Passed by: Dr Keyur Somani

Date: 22<sup>nd</sup> December 2014

---

Element verify that tensile specimens of PPE elastomer compound V91 K (BATCH 29922/01/1) have been exposed in a multi-phase sour fluid at 121-175°C for up to 8 weeks. The test gas mixture contained 2<sub>mol</sub>% H<sub>2</sub>S. Material performance was assessed by tracking changes in volume, hardness and tensile property levels, all measured at room temperature. The point of reference for tensile is the end of the first soak period at the highest temperature.

### **Test Conditions**

#### **Exposure fluid composition and distribution**

<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 (de-ionised)
60	70% heptane, 20% cyclohexane, 10% toluene

Test temperatures and sampling intervals used in the NORSOK M-710<sup>1</sup> programme are shown in the table below; test pressure was 100 bar.

#### **Exposure test conditions**

<b>Temperature (°C)</b>	<b>Intervals (days)</b>
121	7, 14, 28, 35, 42, 50
150	7, 14, 28, 42, 56
175	7, 14, 28, 40, 54

### **Summary for V91K**

<b>Temperature (°C)</b>	<b>End of exposure period (NORSOK acceptance range)</b>					<b>ACCEPTANCE TO NORSOK M-710</b>
	<b>Volume swell</b>	<b>Hardness change</b>	<b>Modulus at 50%</b>	<b>Tensile Strength</b>	<b>Elongation at Break</b>	
	<b>+25/-5%</b>	<b>+10/-20 units</b>	<b>±50%</b>			<b>YES/NO</b>
<b>121</b>	8.2	-6	17	-32	-37	<b>YES</b>
<b>150</b>	9.1	-13	10	5	-5	
<b>175</b>	22.2	-20	-20	-15	11	

The changes in room temperature tensile property levels are within the allowable range after exposure periods at 121-175 °C of 7-8 weeks. Swelling and hardness change levels are also acceptable.

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