

To better serve our customers manufacturing high performance valves and wellhead equipment for the oil and gas industry, CDI Energy Products has evaluated several CDI elastomeric seal compounds to ISO 23936-2.

ISO 23936-2:2011, Non-Metallic Materials in Contact With Media Related to Oil and Gas Production, Part 2: Elastomers specifies requirements for NORSOK M-710 Edition 3, Annex B. Testing was conducted to ISO 23936-2:2011 Annex A: Ageing of Elastomeric Materials and to Annex B: Rapid Gas Decompression (RGD). The compounds selected are extensively used in sealing solutions provided by CDI Energy Products.

The testing was contracted with independent laboratories, Akron Rubber Development Laboratory Inc. (ARDL) located in Ohio, USA and Alpine Polytech located in Texas, USA.

### Annex A:

This procedure is used to qualify elastomer compounds for service in liquids and gases representative of the intended application environment. The test parameters that can be selected are the composition of the hydrocarbon liquid phase, the gas phase and three test temperatures. The test temperatures used are intended to be above the recommended service temperature of the polymer used to compound the material. These are selected based on API 6A or ISO 10423 temperature classifications in table A.6. Based on changes in physical properties in the elastomer at different intervals, an Arrhenius plot of estimated service life can be generated.

AS568-222 O-Rings or ISO-37-2 tensile bars are aged in the test chamber at the specified temperature and media at 10 MPa (1450 psi) or 6 MPa (870 psi). At specified intervals the chamber is depressurized and test samples are removed and then the chamber is re-pressurized with media and aging is continued until the specimens no longer meet the standard acceptance criteria or time is expired.

Phase	Composition	Test Temperature	Test Pressure	Duration
Liquid	60% As Specified (Aromatic or Non-Aromatic)	3 Intervals Specified, All Above Maximum Service Temperature For The Polymer	10 MPa (1450 psi) or 6 Mpa (870 psi)	As Specified Gas For Each Temperature
Gas	30% As Specified (Sweet or Sour)			
Water	10% Deionized			

### Annex B:

This procedure is used to qualify elastomeric materials for service in gas environments that could subject elastomeric materials to Rapid Gas Decompression (RGD) or Explosive Decompression (ED). AS568-325 O-Rings were molded from standard compounds; the specimens were saturated in a pressurized methane/carbon dioxide environment, and then subjected to 8 decompression cycles over a period of 7 days. The O-Rings were then evaluated to the rating system outlined in the ISO 23936-2, Annex-B standard.

Mol %	Composition	Test Temperature	Test Pressure	Duration
10	CO <sub>2</sub>	100°C (212°F)	15 MPa (2176 psi)	7 days
90	CH <sub>4</sub>			

# Technical Report

## ISO / NORSOK Certified Elastomer Materials

The performance of the compounds is summarized in the grid below.

CDI Compound	Description	Annex A: Chemical Ageing		Annex B: RGD
		Test Parameters	Acceptance Criteria	Visual Acceptance Criteria
803-80	80a HNBR – Resilient	A.5 Sour Multiphase A.6 Non-ISO / API	Tested	Pass – 1100
809	90a HNBR – Oilfield Service	A.5 Sour Multiphase A.6 Non-ISO / API	Tested	Pass – 3333
801-85	85a HNBR – RGD Resistant	A.5 Sour Multiphase A.6 Non-ISO / API	Tested	Pass – 2111
9140621	90a HNBR – RGD Resistant	A.5 Sour Multiphase A.6 Non-ISO / API	Tested	Pass – 0000
9140631	85a HNBR – Low Temp	A.5 Sour Multiphase A.6 Non-ISO / API	Tested	Pass – 1000
901-90	90a FKM-2 – Peroxide Cure	A.5 Sour Multiphase A.6 API-X	Tested	Pass – 0000
909HV	90a FKM-1 – Bisphenol Cure	A.5 Sour Multiphase A.6 API-X	Tested	Pass – 2111
909LT	90a FKM-3 – Low Temp	A.5 Sour Multiphase A.6 API-X	Tested	Pass - 0000
9021581	92a FKM	A.5 Sour Multiphase A.6 API-X	Not Tested	Pass – 0000
9021602	92a FKM – Low Temp	A.5 Sour Multiphase A.6 API-X	Not Tested	Pass – 1000
408	80a NBR – Sulfur Cure	A.4 Sweet Multiphase A.6 API – U,V	Tested	Pass – 3333
408LT	80a NBR – Low Temp	A.4 Sweet Multiphase A.6 API – U,V	Tested	Pass – 2111
409XR	90a NBR – Sulfur Cure	A.4 Sweet Multiphase A.6 API – U,V	Tested	Pass – 0000
9003010	90a NBR – ED Resistant	A.4 Sweet Multiphase A.6 API – U,V	Not Tested	Pass – 0000

Per ARDL Test Reports PN102808, PN103020, PN103335, PN1034363, PN104363, PN105110, PN131606 and Alpine Polytech APT-TR-PP181213, certification according to ISO 23936-2:2011, Annex-B applies to CDI grades listed above. More detailed test information is available upon request from CDI Energy Products.

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