

## NORSOK Approved Compounds



The NORSOK standards have been developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for existing and future petroleum industry developments.

The intent of NORSOK M-710 standard and qualification process is to assure that non-metallic sealing material manufacturers have sufficient understanding and experience with the applicable materials to provide them with acceptable performance characteristics in the specified environment. The standard defines the requirements for critical sealing for permanent subsea use including; well completion, Xmas trees, control systems and valves.

As the accredited UK partner of Parker Hannifin Seals, Ceetak are pleased to announce the availability of 24 special polymeric compounds approved to NORSOK M-710 and aimed specifically for the Energy, Oil and Gas industry.

The testing was conducted by Merl Ltd (a leading independent UK laboratory) and the technical requirements for the testing of the compounds was divided into 2 sections; the effects of sour gas ageing and rapid gas decompression (explosive decompression).

The positive results passed 24 compounds; a range of Hydrogenated Nitrile (HNBR), Carboxylated Nitrile (XNBR), Fluorocarbons (FKM/FFKM), Polyetherketones (PEEK) and Polytetrafluoroethylenes (PTFE).

The qualification of these materials reinforces Parker Hannifin's position as a leading manufacturer of oilfield sealing materials. As their accredited UK partner, Ceetak offer sales, design and service support from our Aberdeen based facility.

Benefits to customer:-

- Wide range of accredited compounds for oilfield industry
- Technical design input from experienced application engineers with the added support of Parker's world class manufacturing facilities
- Local stock & support from Aberdeen facility



## Approved to Rapid Gas Decompression specifications

Elastomer	Type	Cycles			NORSOK
		1	5	10	
KB163	HNBR	1000	1100	3100	Pass
N4007	HNBR	0000	2222	2222	Pass
V1041	TFE/P	1000	5100	3100	Pass
V1238	FKM	0000	0000	3100	Pass

The rating procedure for Rapid Gas Decompression is shown below:

- 1) Examine four cut cross sections of the O-ring which has been subjected to RGD.
- 2) Rate the cracks according to the table below (Ratings of 4 and 5 are unacceptable).
- 3) Record the ratings of each seal by listing the individual ratings in order of the highest first to the lowest last.

Description	Rating
No internal cracks, holes or blisters of any size.	0
Less than 4 internal cracks, each shorter than 50% of the cross section, with a total crack length less than the cross section.	1
Less than 6 internal cracks, each shorter than 50% of the cross section, with a total crack length of less than 2.5 times the cross section.	2
Less than 9 internal cracks of which max. 2 cracks can have a length between 50% and 80% of the cross section.	3
More than 8 internal cracks or one or more cracks longer than 80% of the cross section.	4
Crack(s) going through the cross section or complete separation of the seal into fragments.	5

Example: A rating of 5422 represents:

- One section with one or more cracks going through the seal cross section
- One section had more than 8 cracks or minimum 1 crack > 80% of the seal cross section
- Two sections had <6 cracks < 50% of the cross section



## Approved to H<sup>2</sup>S Ratings

### Elastomer H<sup>2</sup>S results

Material	Type	NORSOK Acceptance Criteria		
		Tensile	Visual	Volume
N4263	XNBR	Pass	Pass	Pass
KB163	HNBR	Pass	Pass	Pass
KA183	HNBR	Pass	Pass	Pass
N4007	HNBR	Pass	Pass	Pass
V1289	FKM	Pass	Pass	Pass
VP104	FKM	Pass	Pass	Pass
V1238	FKM	Pass	Pass	Pass
FF102	FFKM	Pass	Pass	Pass
FF200	FFKM	Pass	Pass	Pass
FF202	FFKM	Pass	Pass	Pass
V8534	FFKM	Pass	Pass	Pass
V8588	FFKM	Pass	Pass	Pass
V1041	TFE/P	Pass	Pass	Pass
VP103	TFE/P	Pass	Pass	Pass

#### Extract from MERL's report:

"The effect of hydrocarbon liquids on the mechanical performance of elastomers is well established, usually causing reductions in strength dependent on the quantity of liquid absorbed. For the nitrile based elastomers, the effect of H<sub>2</sub>S can also be significant, resulting in excessive stiffening and eventual embrittlement in extreme cases. The four nitrile-based elastomers performed well, giving reasonable life predictions for 100°C service in 2% H<sub>2</sub>S. N4263 (XNBR), KB163 (HNBR), N4007 (HNBR) and KA183 (HNBR) exhibited good levels of H<sub>2</sub>S resistance with anticipated service lives based on tensile decreases at 100°C of 4.5, 10.6, 17.3 and 177 years respectively. For the majority of the fluoroleastomers, after the initial loss in tensile performance brought about by liquid absorption, there was very little additional consistent change in properties thereafter. Predicted service lives at 150°C for a 50% decrease in tensile performance range from 6 years for VP104 (FKM) to thousands of years for V8534 (FFKM)."

Material	Type	NORSOK Acceptance Criteria		
		Tensile	Visual	Volume
AP02	PTFE	Pass	Pass	Pass
AP05	PTFE	Pass	Pass	Pass
AP09	PTFE	Pass	Pass	Pass
AP31	TFM	Pass	Pass	Pass
AP45	PTFE	Pass	Pass	Pass
AP63	PTFE	Pass	Pass	Pass
AP66	PEEK	Pass	Pass	Pass
AP68	PEEK	Pass	Pass	Pass
APV6	PTFE	Pass	Pass	Pass
W4685	PEEK	Pass	Pass	Pass
K2	PEEK HPV/PTFE	Pass	Pass	Pass

#### Extract from MERL's report:

"The results strongly suggest chemical stability in this synthetic field-representative sour fluid. The magnitude of changes in tensile strength, elongation at break and Young's modulus remains well within the NORSOK-acceptable +/- 50% range for all thermoplastics tested. Hence it is reasonable to conclude, given that these are engineering thermoplastics, that longer periods at each temperature would not result in these limits being breached."

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