James Walker®

FR68/90 New Generation elastomer for the oil & gas industry

Issue 2

- **Setting new standards in resistance to rapid gas decompression (RGD)**
- **Perfect ‘0000’ Norsok rating at elevated temperatures up to and including 150°C**
- **Perfect ‘0000’ Norsok rating at large cross sections up to and including 10.0mm**

High Performance Sealing Technology

James Walker

FR68/90 RGD performance

New Generation

The launch of the first of our New Generation elastomers follows an intensive two year programme of research, development and testing. The results of this programme are a material offering real advances in performance – not a compromised solution where some material properties are advanced at the expense of others.

No compromise in performance

Although the RGD performance of FR68/90 is in a different league to existing elastomer technology, the advances in RGD resistance have not been achieved by sacrifice and compromise in other material characteristics.

FR68/90 is James Walker's premium fluoroelastomer (FKM) offering for RGD resistance where contact with amines, H_2S, hot water or steam is an important secondary operational consideration. In addition, FR68/90 offers further class-leading performance with;

- **Ultra-low compression set of 8% providing outstanding seal stress retention**

Elevated temperature

FR68/90 has been subjected to Norsok M-710 RGD testing at elevated temperatures providing perfect pass '0000' ratings for a 5.33mm section at up to 150°C.

Section mm	100°C	125°C	150°C
5.33	0000	0000	0000
6.99	0000	Results of testing in accordance with Norsok M-710 Rev 2 Annex B	
8.40	0000		
10.00	0000		

Large cross-section

The standard 'O' ring crosssection assessed for qualification is 5.33mm, but in developing the New Generation materials we have currently tested sections of up to 10.00mm at the standard 100°C Norsok test.

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Norsok M-710 testing explained

In order to maximise operational safety in terms of RGD resistance, James Walker utilises the '0000' rating (zero damage) as the key benchmark for its own materials as this is the only rating at which the material has suffered no visible damage under test.

Norsok performance benchmark

In assessing RGD performance James Walker has chosen the Norsok M-710 qualification criteria, testing at 100˚C (212˚F) using a pressure of 150bar (15MPa) and a decompression rate of 35bar/minute (3.5MP/minute). ***This is well in excess of the 20bar/minute industry standard.***

Following the decompression procedure each test seal is cut into four equal radial sections and the resulting cross sections examined for internal cracks with a microscope or other visual means providing at least 10x magnification. Observations are then rated from 0 to 5.

Zero denotes no damage, 1 to 3 increasing damage sustained, 4 and 5 denoting too much damage sustained to pass the test.

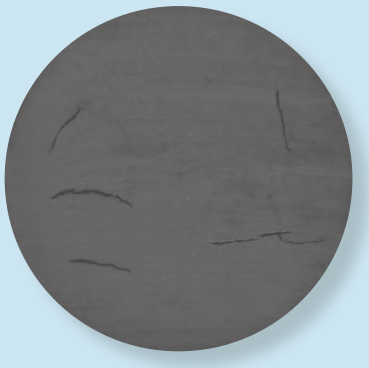
The "overall rating" for a set of three replicate seals is defined on a worst case basis as the highest rating for each cross section over the three replicates. Thus, if the rating for three seals were 1110, 3110, 2220, the overall rating would be 3220 and the seal would pass the test.

Norsok rating system

A perfect '0000' rating demonstrates that there was no evidence of any damage on any sample following the RGD test.

0 rating – Pass
No internal cracks, holes or blisters of any size.

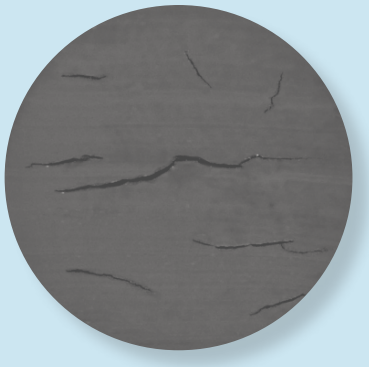
1 rating – Pass
Less than 4 internal cracks, each shorter than 50% of cross section with a total crack length less than the cross section, although the material integrity is still compromised.



2 rating – Pass
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.

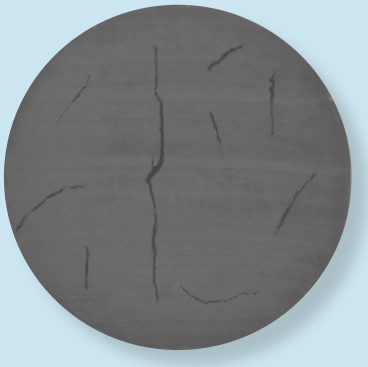
The pass / fail margin

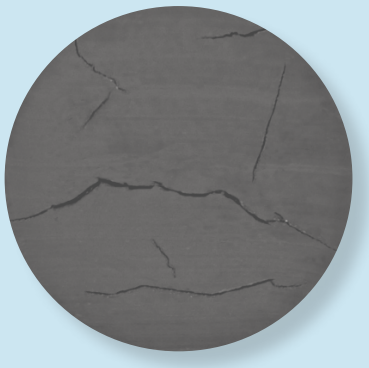
It is still possible to claim a pass on the Norsok M-710 rapid gas decompression test even at a rating such as '3333'.



3 rating – Pass
Less than 9 internal cracks of which max. 2 cracks can have a length between 50% and 80 % of the cross section.

4 rating – Fail
More than 8 internal cracks or one or more cracks longer than 80 % of the cross section.





5 rating – Fail
Crack(s) going through cross section or complete separation of the seal into fragments.

Compromised safety and performance

The potential difference between a 3 rating pass and a 4 rating fail can be incredibly small.

Under true operational conditions, damage of this level can impair seal performance and will offer virtually no safety margin.

A comparison between FR68/90 and an alternative elastomer material following RGD testing illustrates the importance of selecting the correct material for applications prone to RGD.

It must be remembered that these levels of damage are being observed as a result of a carefully controlled test.

Under operational conditions fluctuations in media composition and temperature can further compromise RGD performance and increase the possibility of seal failure.

A '0000' rating represents the maximum achievable operational safety margin.

FR68/90 new opportunities

Extending elastomer capabilities

The achievements of FR68/90 in withstanding RGD has the capability to take elastomeric sealing into new territory. Prior to the successful development of FR68/90, elastomers could not offer the required RGD performance at large sections. More expensive options had to be pursued, often involving complex and costly re-engineering of components to accept solutions such as spring energised PTFE seals, which are more sensitive to surface finish and more difficult to install.

Unlike some materials with high resistance to rapid gas decompression, FR68/90 retains excellent flexibility, making fitting of seals manufactured from this compound far easier.

For the first time, an elastomer can be used to provide a cost effective option for large section seals with no compromise on RGD performance; bringing huge potential benefits for customers.

Existing tooling

The advanced polymer architecture of James Walker's New Generation fluorocarbon compounds provides an IRHD 90 hardness and a material that is as easy to mould as our standard compounds.

This allows us to use our existing tooling and production methods, which means, with existing moulds from our extensive fluorocarbon tooling library, products can be manufactured without delay.

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General information

Health warning: If PTFE or fluoroelastomer (eg, FKM, FFKM, FEPM) products are heated to elevated temperatures, fumes will be produced which may give unpleasant effects, if inhaled. Whilst some fumes are emitted below 250°C from fluoroelastomers or below 300°C from PTFE, the effect at these temperatures is negligible. Care should be taken to avoid contaminating tobacco with particles of PTFE or fluoroelastomer, or with PTFE dispersion, which may remain on hands or clothing. Material Safety Data Sheets (MSDS) are available on request.

Information in this publication and otherwise supplied to users is based on our general experience and is given in good faith, but because of factors which are outside our knowledge and control and affect the use of products, no warranty is given or is to be implied with respect to such information. Unless governed by type approval or contract, specifications are subject to change without notice. Statements of operating limits quoted in this publication are not an indication that these values can be applied simultaneously.

To ensure you are working with the very latest product specifications, please consult the relevant section of the James Walker website: www.jameswalker.biz.

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