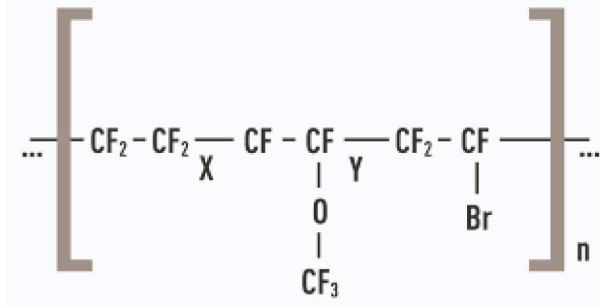


# FFKM PERFLUORELASTOMER

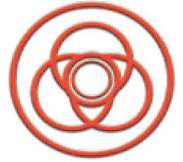


REZINFLUOR brand perfluoroelastomers are a class of elastomers corresponding to the code >FFKM< according to the classification given by the international standard ASTM D 1418.

Therefore, the >FFKM< code does not correspond to a single material, but the >FFKM< family constitutes a class of many different formulation types, each of them specific for the various application orientations.

For many applications, from process chemistry to oil & gas, via the semiconductor industry or for applications in the aeronautical propulsion sector, there is currently no alternative to the use of perfluoroelastomers, >FFKM<, precisely in due to their performance specificity.





## FFKM Compound Technical features

Unmatched resistance to the majority of chemicals compared to all other elastomers;



Thermal stability up to ~260°C/275°C and for some grades up to 300°C/325°C/340°C;



Excellent ability to recover the imposed deformation (Compression Set)



Very low permeability to fuels and many hydrocarbon gases;



Excellent performance in lubricating systems with high oxidative stability typical of aeronautical turbines;



Unmatched resistance to petroleum gases with high concentration of H<sub>2</sub>S;

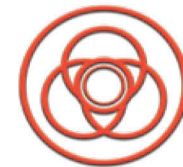


Depending on the formulation resistance to water vapor up to 200°C and even ~300°C;

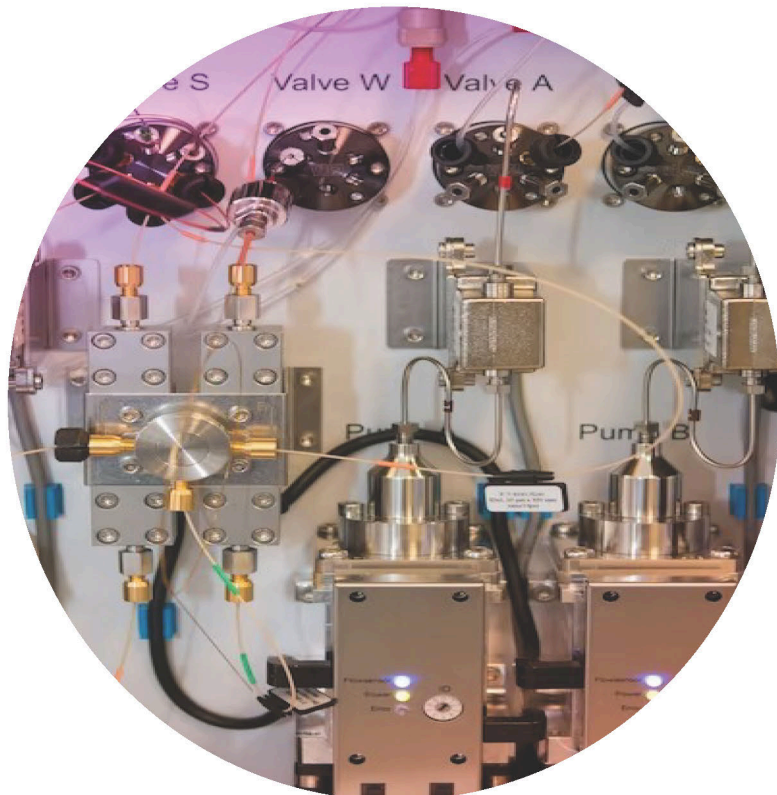


Very high fire resistance.





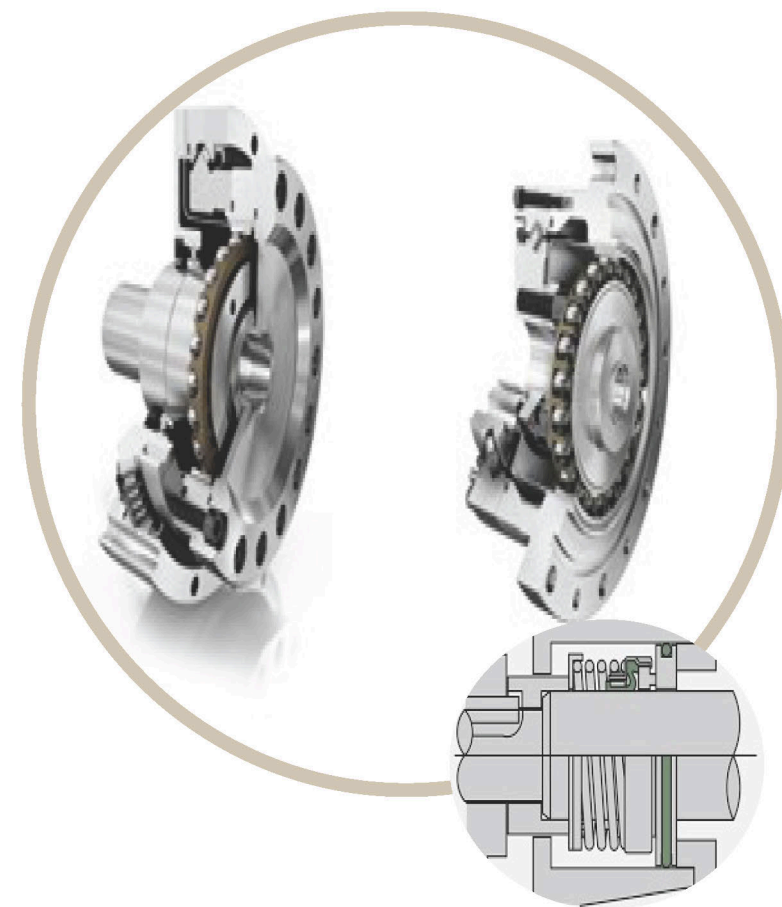
## Process instrumentation



## Valves



## Mechanical seals







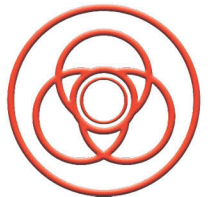
Rezinfluor® 75 NHAG 13 is designed to offer outstanding performance over the widest possible range of chemistry and temperature applications.

Mixed flows, once a problem for many chemical converters, can now be handled by Rezinfluor® 75NA-G 13, furthermore, the curing system allows its use even for a maximum service temperature of 230 °C with peaks at 260 °C (for short durations) which results in improved chemical resistance in all temperature ranges, especially if high temperature process excursions occur

## REZINFLUOR® 75NA-G13

### Typical Physical Properties

			Test Method
Color	Black		
Hardness	Shore A	77 ( 75±5)	ASTM D 2240
100% Modulus	MPa	8.80	ASTM D 412
Tensile Strength	MPa	19	ASTM D 412
Elongation	%	155	ASTM D 412
Compression Set : 70 hr @ 200 °C		18,7%	ASTM D 395 B
	70 hr @ 250° C	29 %	ASTM D 395 B





# 75NA- G13

*Broadest Chemical Resistance*

- 75NA – G13 parts, developed specifically for the chemical processing industry, are designed to give
- **outstanding performance in the widest possible range of chemicals and temperatures.**
- This product is an excellent choice for use in acids, bases, amines, steam, pure ethylene oxide, and many other aggressive chemicals. The curing system also allows for a maximum service temperature of 275 °C (527 °F). This high temperature stability translates to increased chemical resistance over all temperature ranges, especially if high temperature process excursions occur. This combination of chemical and thermal resistance provides advantages for chemical processors.



**Rezinfluor**<sup>®</sup>  
FFKM lean fast customized







# FFKM 75 NB-G16

Rezinfluor<sup>®</sup> 75NB-G16 FDA approved is designed to overcome specific sealing challenges found in the food, dairy, pharmaceutical, biomedical sectors.

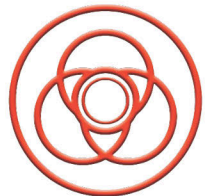
The operating temperatures are between -15°C and + 230° C.( pick 260°C )

Rezinfluor<sup>®</sup> 75NB-G16 FDA uses compounds formulated in compliance with FDA specification 21 Cfr 177.2600 and 3rd Sanitary Standard Based on perfluoropolymers compatible with FDA FCN nr 128

## REZINFLUOR FFKM 75 NB-G16 FDA

### Typical Physical Properties

			Test Method
Color	white		
Hardness	Shore A	78 ( 75± 5)	ASTM D 2240
Tensile Strength	MPa	14	ASTM D 412
Elongation	%	155	ASTM D 412
Compression Set : 70 hr @ 200 °C		25 %	ASTM D 1414-or 214





# FFKM 75NTS-G12

Rezinfluor75NTS-G12 IS A LOW COMPRESSION PRODUCT FOR GENERAL USE IN O-RINGS, DIAPHRAGM, SEALS AND OTHER PARTS USED IN CHEMICAL PROCESSES AND IN THE AERONAUTICAL INDUSTRY.

Rezinfluor 75NTS-G12 IS CARBON-FILLED WITH EXCELLENT CHEMICAL RESISTANCE, GOOD MECHANICAL PROPERTIES AND EXCEPTIONAL HOT AIR AGING PROPERTIES. IT HAS A LOW SWELLING OF ORGANIC ACIDS, INORGANIC ACIDS AND ALDEHYDES AND HAS A GOOD RESPONSE TO THE EFFECTS OF THE THERMAL CYCLE. A MAXIMUM SERVICE TEMPERATURE OF 316°C (600°F) IS SUGGESTED, WITH SHORT EXCURSIONS TO HIGHER TEMPERATURES POSSIBLE

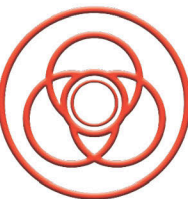
Rezinfluor ® 75NTS-G12 IS NOT RECOMMENDED FOR USE IN HOT WATER/STEAM APPLICATIONS OR IN CONTACT WITH CERTAIN HOT ALIPHATIC AMINES, ETHYLENE OXIDE OR PROPYLENE OXIDE.

## REZINFLUOR 75NTS-G12

### Typical Physical Properties

Color	Black		
			Test Method
Hardness	Shore A	76 ( 75± 5)	ISO 7619-1
100% Modulus	MPa	7.0	ISO 37
Tensile Strength	MPa	18.6	ISO 37
Elongation	%	140	ISO 37
Compression Set : 70 hr @ 275°C		12.7%	ISO 815-1 Meth.A
	70 hr @ 300° C	18.5%	ISO 815-1 Meth.A
	70 hr @ 316	22.7%	ISO 815-1 Meth.A

Excellent thermal stability  
Excellent chemical resistance  
Excellent compression set resistance  
Good response to temperature cycling effects





## Parts Product Overview

# FFKM 75NAU-G17

FF KM 75NAU-G17 perfluoroelastomer parts are designed for various applications, including :  
mechanical seals, where superior chemical resistance and low compression set are critical for successful sealing performance.

To extend equipment Mean Time Between Repair (MTBR), while offering an excellent combination of properties, including:



Resistance to steam

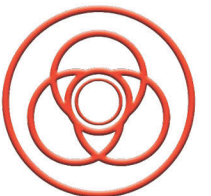


Resistance to acids and bases at maximum service temperatures up to 230° C (446 °F).



**It is an effective alternative to other general purpose perfluoroelastomer parts.**

FFKM 75NAU-G17 perfluoroelastomer parts are designed for various applications, including mechanical seals, where superior chemical resistance and low compression set are critical for successful sealing performance.





## Summary

### Physical properties:

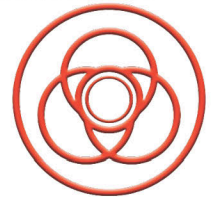
**Rezinfluor FFKM 75NAU-G17** parts and **FFKM 75NA –G13** parts have comparable physical properties (Hardness, Modulus, Elongation at break) except a minor difference of thermal expansion\*.

### Thermal capabilities:

With a maximum service temperature of 230 °C , **FFKM 75NAU G -17** parts can be a suitable alternative to **FFKM75NH-G13** in applications where service temperatures range remain between -15 °C and 200 °C .

### Chemical resistance:

Chemical immersion tests performed in our laboratories did not highlight significant difference in terms of chemical resistance between **FFKM 75NAU-G17** parts and **FFKM75NH-G13** parts except in ethylene oxide media.





# FFKM 75NC-G15

## Typical physical properties

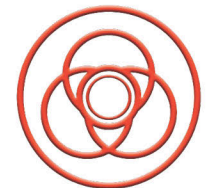
### REZINFLUOR® 75NC-G15

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#### Typical Physical Properties

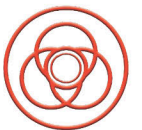
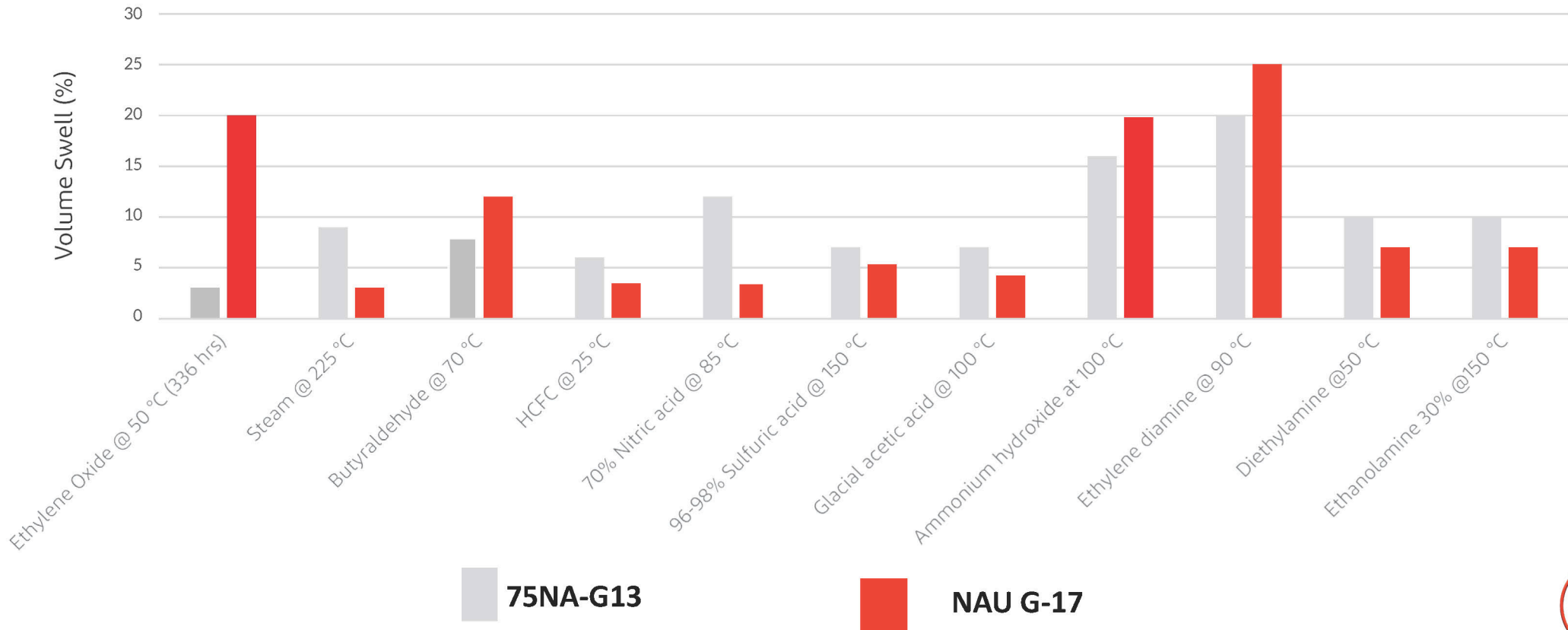
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Color	Black		
Temperature			300°C
			<b>Test Method</b>
Hardness	Shore A	79 ( 80±5)	ASTM D 2240
100% Modulus	MPa	10.2	ASTM D 412
Tensile Strength	MPa	16.9	ASTM D 412
Elongation	%	128	ASTM D 412
Compression Set : 70 hr @ 204 °C	9%		ASTM D 395 B
	70 hr @ 260° C	15 %	ASTM D 395 B





### Fluid ageing\* @ 672 Hours

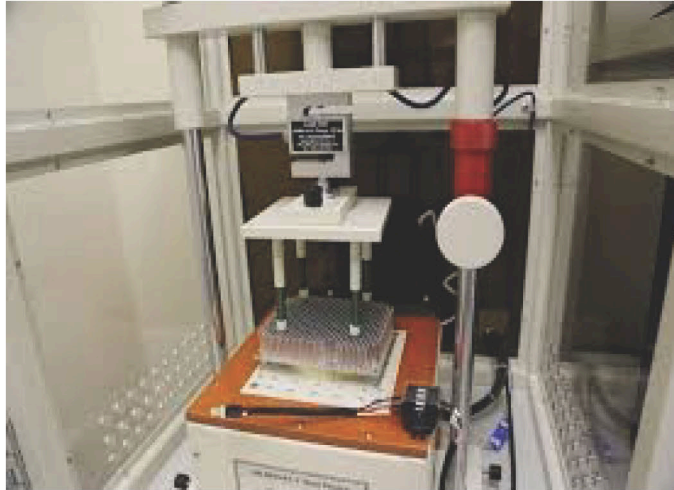


# Thermal resistance

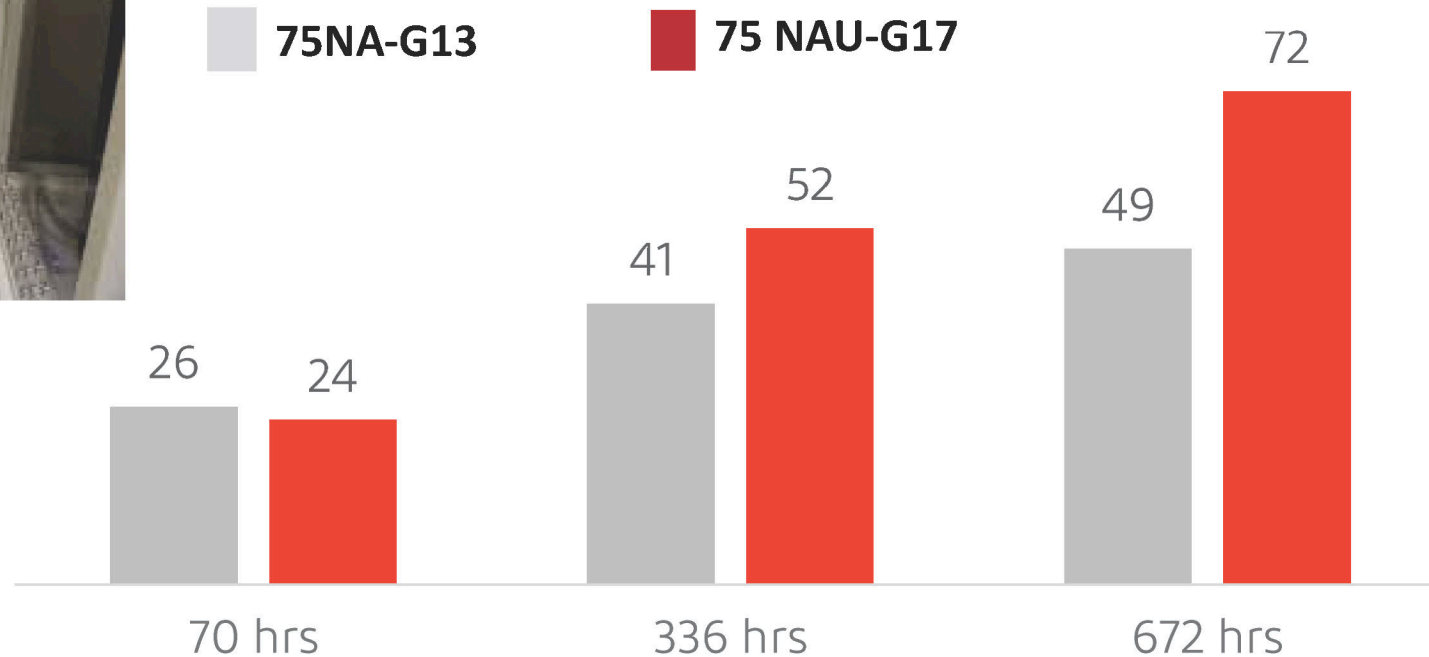
## FFKM 75NAU-G17

$$\theta = \frac{(T_2 - T_1)}{P}$$

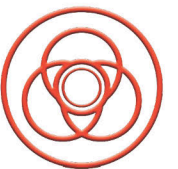
Compression set \*@ 204° C (%)



Thermal resistance  
Laboratory test



FFKM 75 NAU-G17 parts may be a suitable replacement for 75 NA -G13 parts up to 200 °c operating temperatures

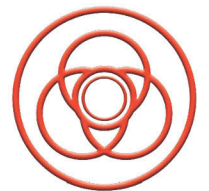




## CHEMICAL RESISTANCE

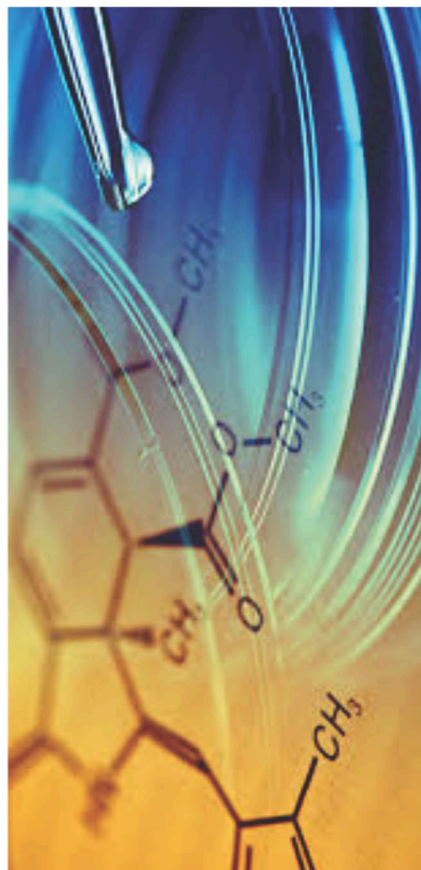


Ethilene Diamine fluid \* (90°C, 672 hours )

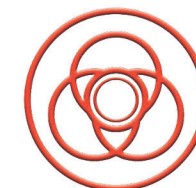


## CHEMICAL RESISTANCE

Ethilene Diamine fluid \* (90°C, 672 hours )



FFKM 75NAU -G17 part show equivalent performance to 75NA-G131 part, while competitive FFKM part shows a strong chemical attack on the surface

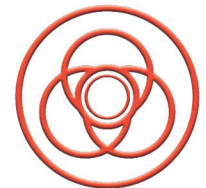




**75NC-G15**



**Chemical Resistance**

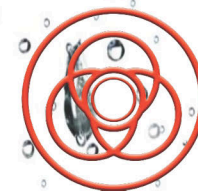






**75NC –G15**

## Resistance to hot water/steam



## Broad chemical resistance & excellent seal force retention in hot water/steam

Rezinfluor FFKM75 NC-G15 perfluoroelastomer parts are designed to reliably seal in the most demanding chemical and hot water/steam environments.

Thermally stable up to 300 °C, 75NC –G15 is a versatile compound than can meet your 80 durometer (Shore A) FFKM specifications in numerous shapes and configurations.



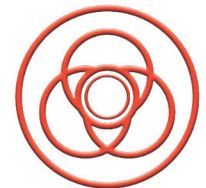




**Rezinfluor**  
FFKM lean fast customized

**FFKM75NC-G15**

**Superior Thermal Stability**





# Why is **75 NC-G15** a better solution?



High end crosslinking technology



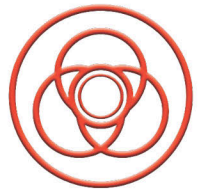
Broad operating temperature (-20 °C to 300 °C)



Superior combined chemical resistance and thermal stability vs competitive FFKM products



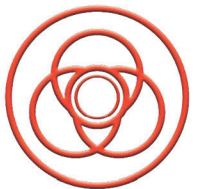
Available in a variety of custom and complex shapes to meet your unique sealing needs



# Typical applications

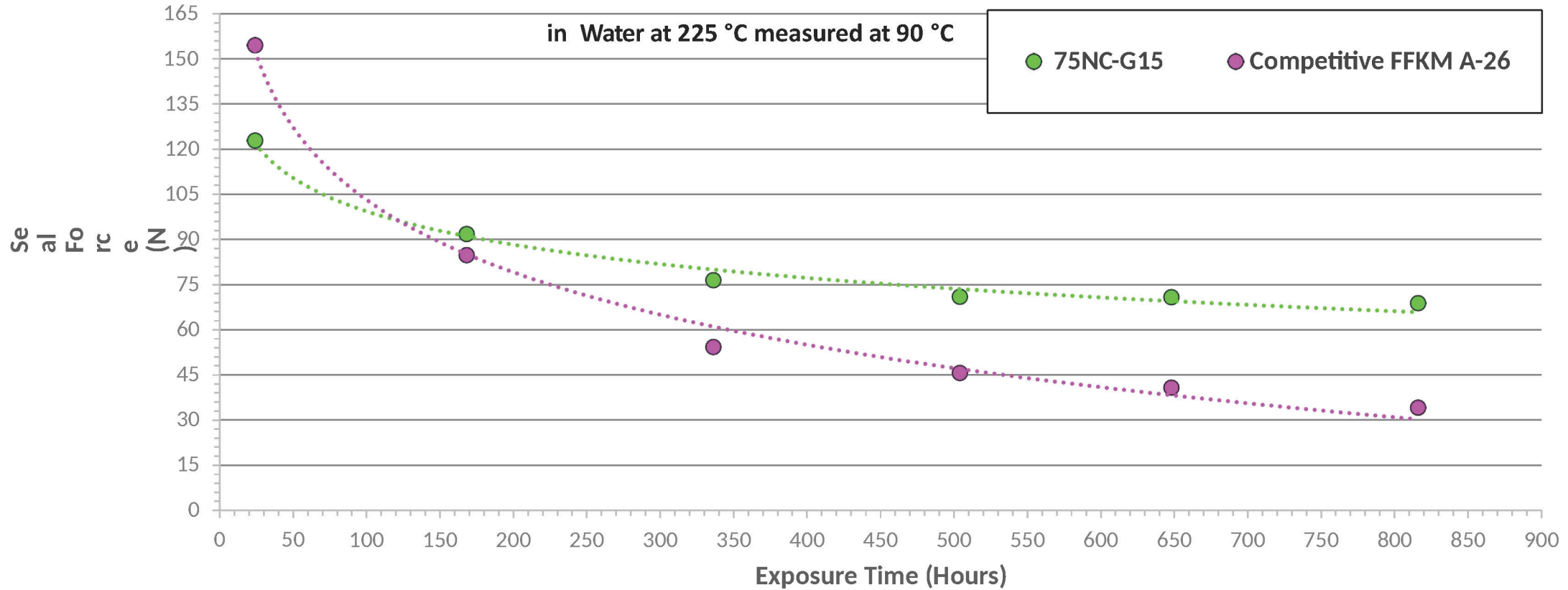
**FFKM 75NC-G15**

- ✓ Completion tools
- ✓ Steam-assisted gravity drainage (SAGD) equipment
- ✓ Drilling & wireline tools
- ✓ Connectors/boots Process
- ✓ Instrumentation Pumps
- ✓ Valves
- ✓ Compressors

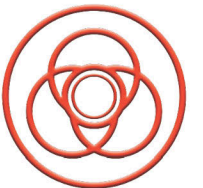




# Compression Stress Relaxation (CSR) **FFKM 75 NC-G15**



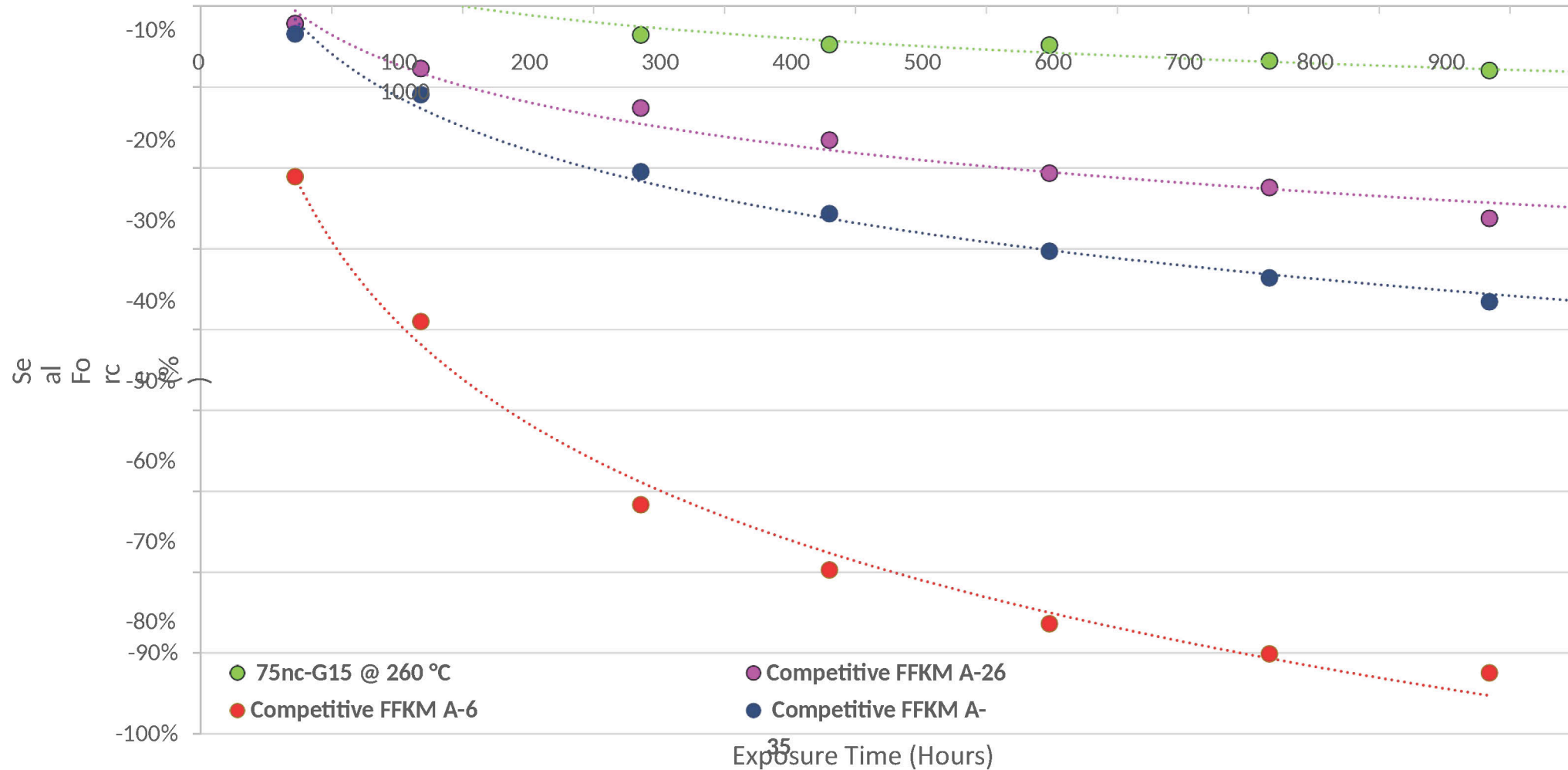
O-rings tested by compression stress relaxation per SAE J2979 at 20% compression



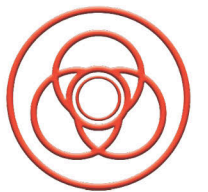
# Compression Stress Relaxation (CSR)

**FFKM 75NC-G15**

in air at 204 °C measured at 90 °C



O-rings tested by compression stress relaxation per SAE J2979 at 20% compression  
**Note:** Seal force (%) calculated as the drop in force VS measured values at 24 hours of exposure

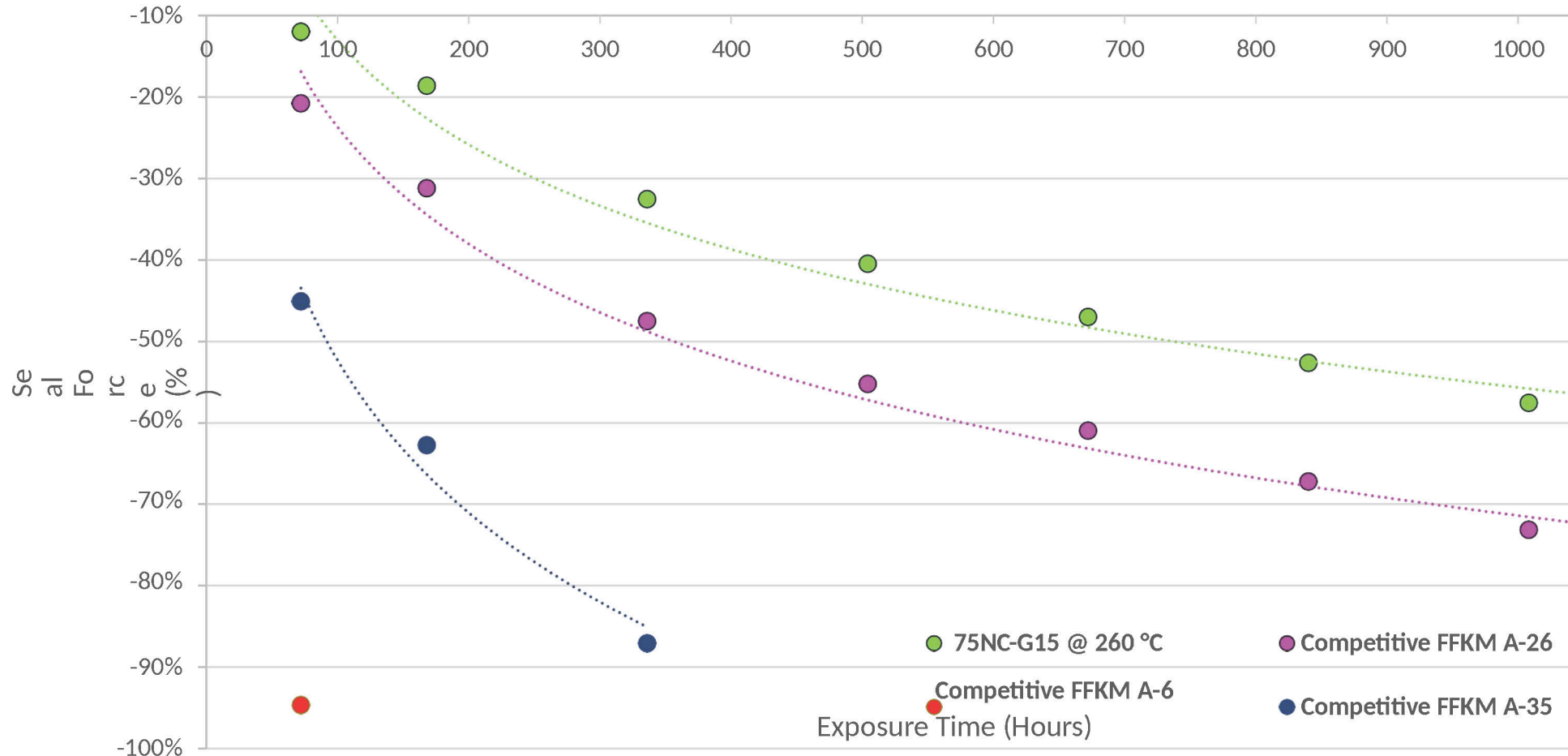




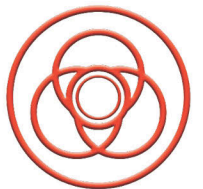
# Compression Stress Relaxation

(CS in air at 260 °C measured at 90 °C)

## 75NC-G15



O-rings tested by compression stress relaxation per SAE J2979 at 20% compression  
**Note:** Seal force (%) calculated as the drop in force VS measured values at 24 hours of exposure

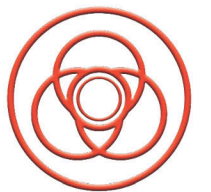
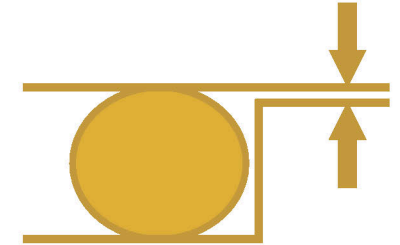




# High Pressure High Temperature Testing



**FFKM75NC-G15**







Wide Temperature range -50°C to 300°C (-58°C to 572°F)



High Pressure from Atmospheric to 300 MPa (43.5 kPSI) for liquid and 100 MPa (14.5 kPSI) for gas



Pressurize environment with possibility to test various fluid and gas



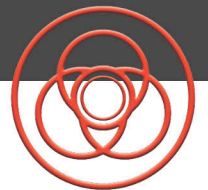
Effect of extrusion gap from 0.1mm diameter to 0.8mm



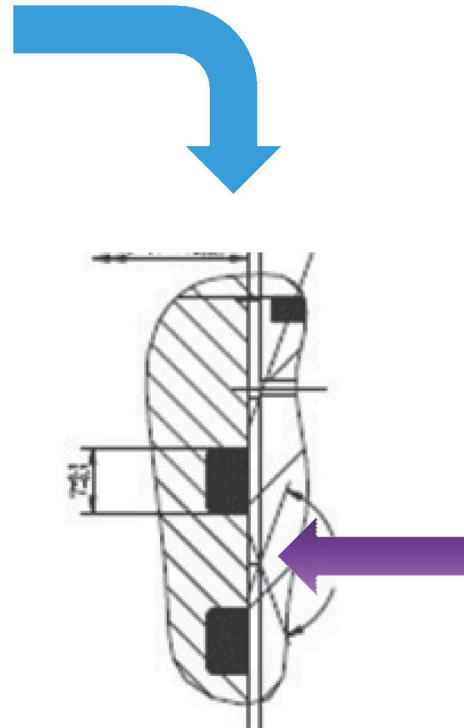
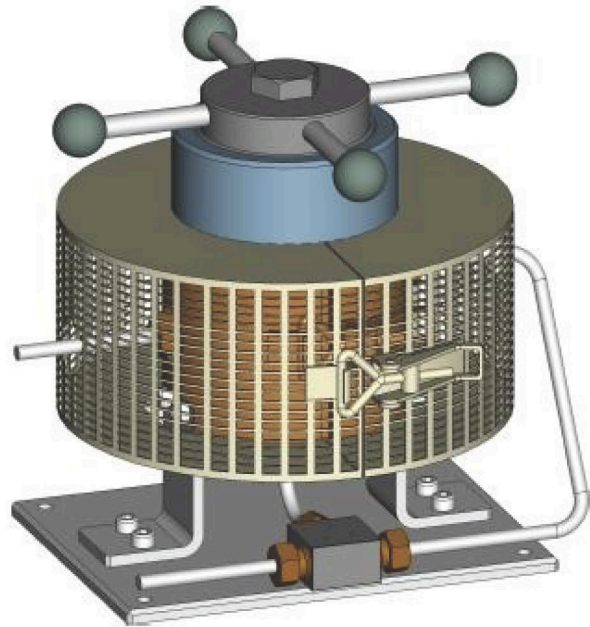
Leak Detection for Low Temperature Sealing Performance Evaluation



Effect of O-Ring compression ratio and backup ring design



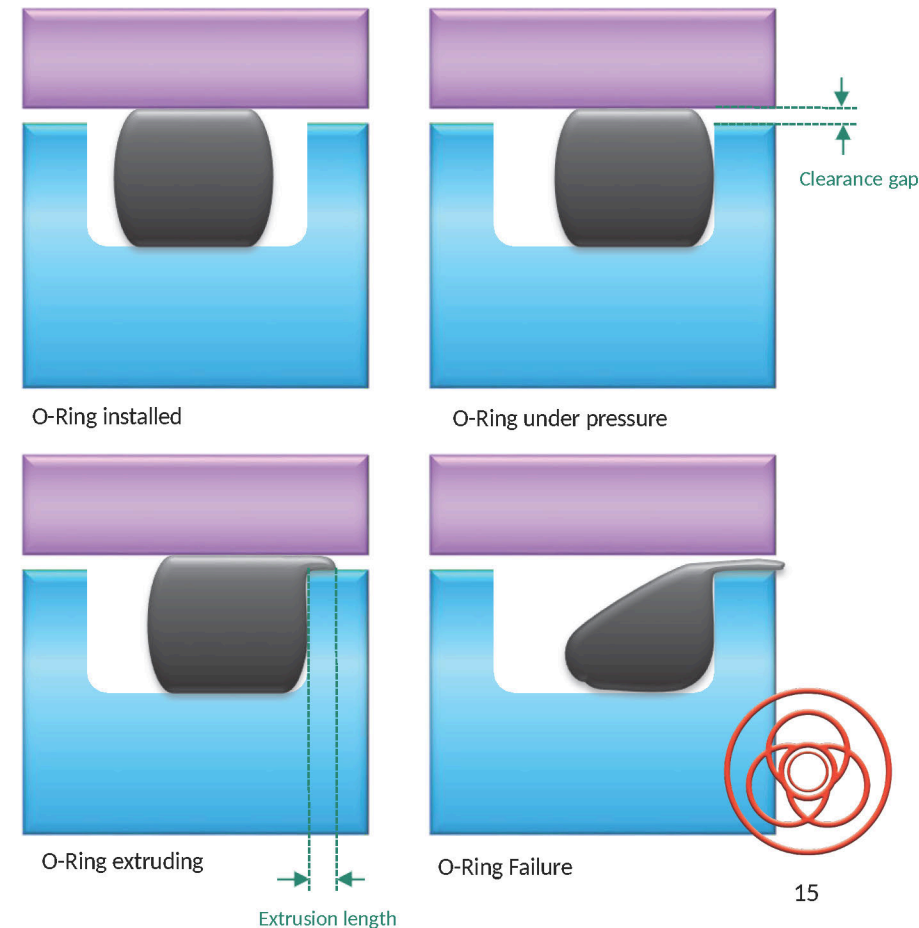
Test cell designed for O-Ring (37.47 x 5.33mm)



## FFKM 75NC-G15

Schematic of O-ring extrusion in the clearance gap due to high pressure application

- Piston groove -

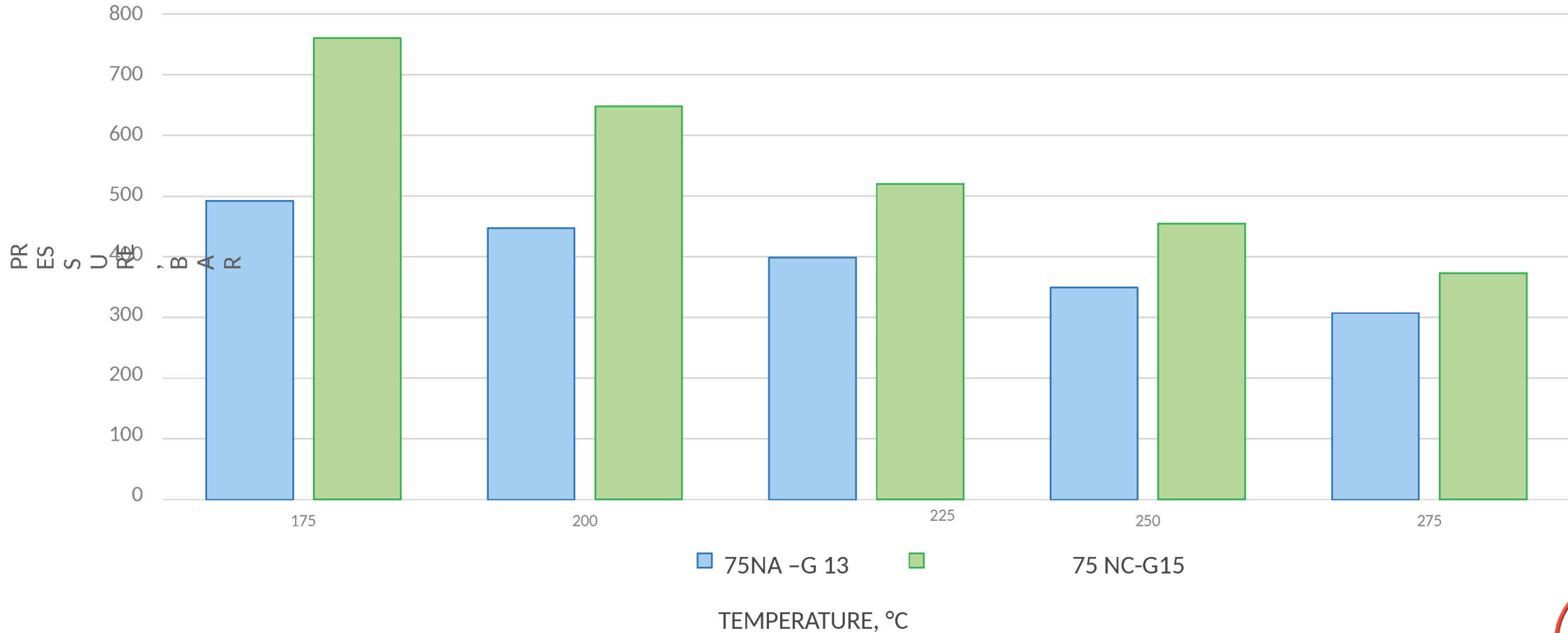




# Gap extrusion:

## High Pressure /High Temperature

Gap extrusion test comparison at 0.2mm between FFKM75NA-G13 & FFKM 75NC-G15



**FFKM 75NC-G15 displays improved gap extrusion resistance compared to a standard 75 Shore A product such as 75NH -G11**

