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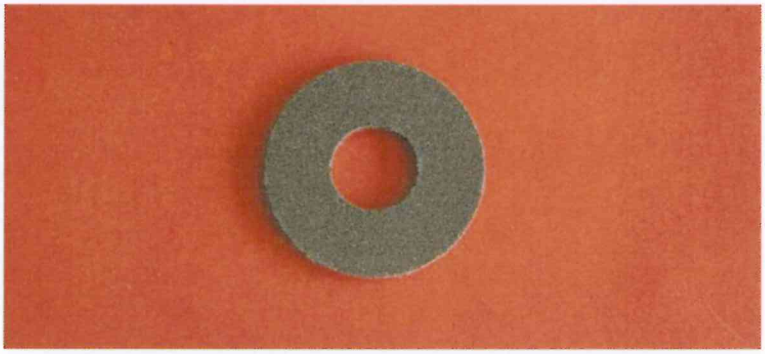
Test Report N°:2011070401	
Place and date of issue:	Rimini, 04/07/2011
Customer:	[redacted]
Date test requested:	17/05/2011
Order number and date:	[redacted] dated 08/06/2011
Date test effected:	from 27/06/2011 till 04/07/2011
Purpose of test:	Salt spray test on nickel graphite silicon gaskets
Test site:	By Emc Test Technologies lab, Via Marecchiese, 273 - Rimini
Equipment Id:	Nickel Graphite silicone Product number SSP502;.

Description of the specimen *.

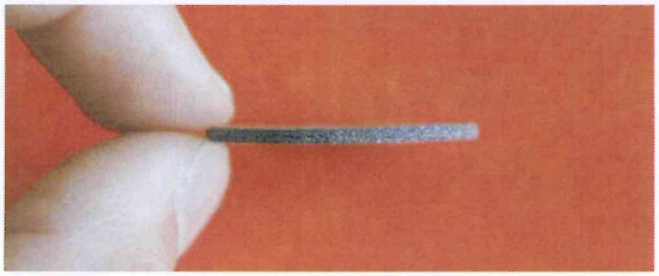
The test specimen also known as EUT (Equipment Under test) consist of Nickel Graphite silicone gasket. Product number SSP502.

(*) according to the statements of the customer

The test specimen consists of a 30mm diameter conductive circular gasket 1,5 mm thick made of nickel-graphite silicone. The specimen has a 12 mm diameter hole in the center.



Pictures of the EUT.



EUT - Thickness details

EUT - Dimensional details

Normative references.

The tests were performed according to the requirements of the following standards:

– ASTM B 117:2003 "Standard practice for operating salt spray (fog) apparatus.

Test equipment

Brand	Model	Description
Fluke	87	Digital Multimeter
Fluke	322	Clamp meter
Sony	Nex 5	Digital camera
Tekno power	-	Digital caliber
Corrotherm	610	Salt spray chamber 1000 liters
Vitrek	344i	Dielectric analyzer
-	-	2 x 25mm diameter cylindrical aluminum electrodes

Environmental condition during the test.

Atmospheric pressure	1012 ± 5 mbar
Room temperature	27.3 ± 3 °C
Relative humidity	47 ± 5%

Test methods and results.

Salt spray test (ASTM B 117).

The test aim to evaluate the degradation of performance (resistance variation due to galvanic corrosion) of the nickel graphite silicone gasket when exposed to the salt spray test (SST). The gasket was properly tightened between two coupled bare aluminum electrodes simulating usual installation.

The test duration was divided in two stages: 48 and 96 hours exposure..

Salt solution

The salt solution used for the test was produced by dissolving 5 ± 1 parts by mass of sodium chloride in 95 parts of water conforming to Type IV water in specification D 1193.

The kind of sodium chloride used complied to Table 1.

TABLE 1 Maximum Allowable Limits for Impurity Levels in Sodium Chloride[A,B]

Impurity Description	Allowable Amount
Total Impurities	≤ 0.3 %
Halides (Bromide, Fluoride and Iodide) excluding Chloride	≤ 0.1 %
Copper	< 0.3 ppm
Anti-caking Agents	0.0 %

The salt solution was adjusted so that the pH of the sprayed solution at 35 °C (95°F) was within the range 6,5 to 7,2.

Air supply

The compressed air supply used to atomize the solution has been pre-filtered and cleaned by grease, oil and dirty by passing through well-maintained filters. This air was maintained at a sufficient pressure at the base of the Air Saturator Tower to meet the suggested pressures of Table 2 at the top of the Air Saturator Tower.

TABLE 2 Suggested Temperature and Pressure guideline for the top of the Air Saturator Tower for the operation of a test at 35°C (95°F)

Air Pressure, kPa	Temperature, °C	Air Pressure, PSI	Temperature, °F
83	46	12	114
96	47	14	117
110	48	16	119
124	49	18	121

Testing machine

The test was performed inside an automated salt spray chamber that automatically manages all the parameters described in the standard such as temperature and pressure of jet.

In the following table , the operating conditions of the test are resumed:

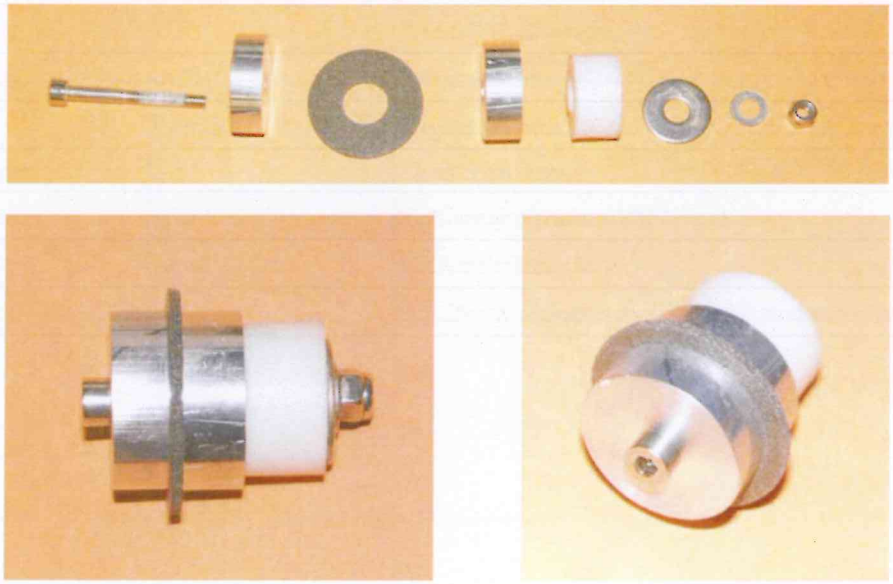
Test method item	Salt spray test
Temperature	35 °C + 1,1 -1,7 °C (95°F +2 -3°F)
Average collection rate for a horizontal collecting area of 80 cm^2	1,5ml/h ± 0,5 ml/h
Concentration of sodium chloride (collected solution)	Sodium chloride: 5 ± 1 parts by mass Water: 95 parts
pH (collected solution)	6,5 to 7,2

Salt spray test (SST).

Preliminary operation

The test specimen was thoroughly cleaned before being assembled and tested.

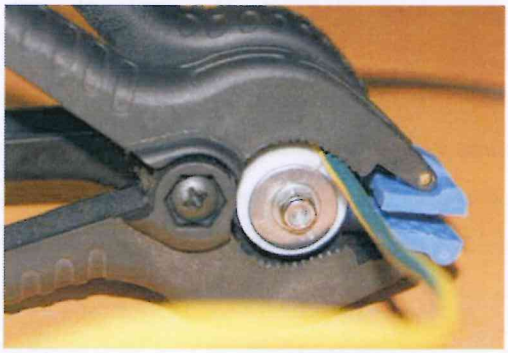
The EUT was clamped between two 25mm diameter bare aluminum electrodes in order to simulate the real use of the seal. The resistance measurement was performed between the two electrodes kept together by a inox steel screw insulted from the electrodes by a TEFLON insulator. Details are shown in the pictures below.



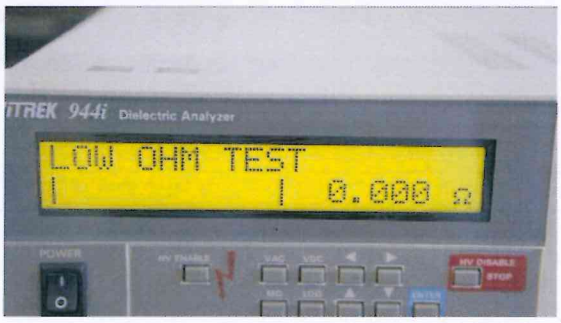
Details of system of electrodes used to simulate gasket clamping.

Continuity resistance before the test

Before the test, initial transversal resistance values were acquired by means of a precision dielectric analyzer. The details of the test are shown in the pictures below.



Details during transversal resistance test before SST exposure



Resistance value before SST

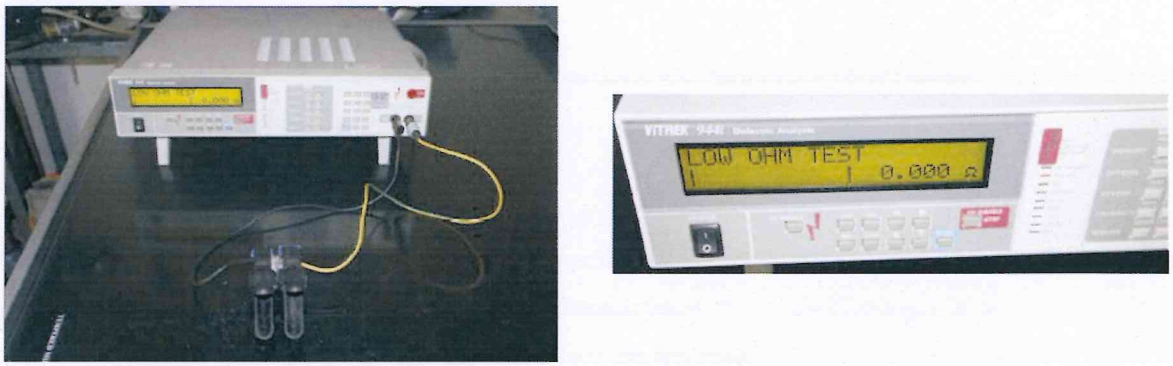
Preliminary operation

The two test specimens were thoroughly cleaned before testing

Stage 1: 48 hours Salt Spray Test exposure

After 48 hours exposure, the test specimens were dried and the transversal electrical resistance measurements were recorded.

Details are shown in the picture below.



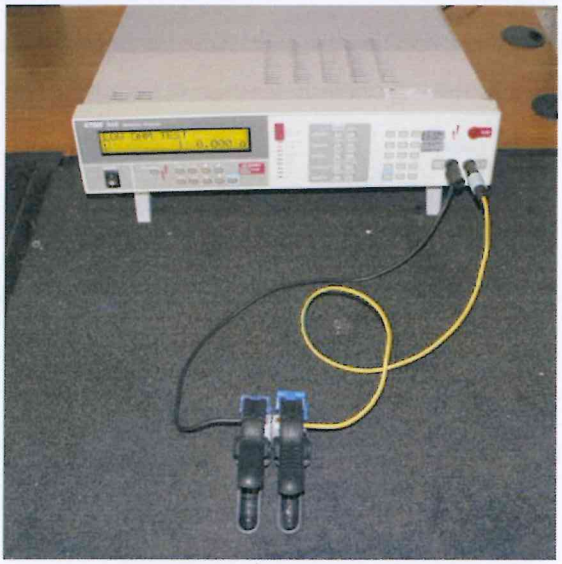
Pictures and results found during transversal resistance test after 48 hours SST.

Oxidation of aluminum electrodes after 48 hours SST.

Stage 2: 96 hours Salt Spray Test exposure

After 96 hours exposure, the test specimens were dried again and their transversal electrical resistance was re-measured.

Details are shown in the pictures below.



Pictures and results found during transversal resistance test after 96 hours SST

Pictures of the EUT and electrodes oxidation after 96 hours SST

Pictures of the EUT and electrodes oxidation after 96 hours SST

Summary of the results

The resistance values measured and percentual degradation after 48 and 96 hours exposure are summarized in the following table:

Resistance before test	Salt spray test 48 h	Degradation 48 h	Salt spray test 96 h	Degradation 96 h
[mΩ]	[mΩ]	[%]	[mΩ]	[%]
0	0	0	0	0

Final considerations

Analyzing the results the performance of the gasket specimen made of Nickel Graphite silicone Product number SSP502 appears not to be influenced by salt fog exposure when properly installed and tightened.

The Test Technicians
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The Testlab Chairman
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L. Marco De Lucia