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ISO 9227 NSS

CORROSION TESTS IN ARTIFICIAL ATMOSPHERES
- SALT SPRAY TESTS -

Program: SQ-0056.V4

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Prepared by:	Reviewed by:	Approved by:
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1. FOREWORD

This report summarizes the results of the **SQ-0056.V4** proficiency testing program on the determination of corrosion resistance of metallic materials. This program is conducted in a bilateral format, following the A.3.3 classification of the ISO 17043 standard ("Split-sample testing schemes").

South Quality conducted the testing program in September/October 2024 with the aim of assessing the laboratory's ability to competently perform the designated tests.

2. ORGANIZATION

Program Coordinator:	Eng. Alfredo Schmidt
Assistant Technician:	Sergio Andrada
Statistic:	Lic. Manuel Tozaki
Supervision:	Eng. Emiliano Medina

3. OBJECTIVE

The objective of this proficiency testing program is to determine of corrosion resistance of metallic materials conducting the neutral salt spray (NSS) using the following standard:

Standard
ISO 9227: 2017

To verify this, batches of metallic sheets have been selected.

Participants in this program have not been previously informed of the time or range of time of appearance of the first sign of corrosion, nor change in mass expected of the samples they receive.

4. PARTICIPANT

Company:	**CERIMME**
Laboratory:	**Metallurgy (Participant B)**
Country:	Morocco
Client ID:	E507
Contact person:	Dounia Abou El Makarim
	Responsable des essais métallurgiques
	dounia.cerimme@gmail.com

5. HOMOGENEITY

Several batches were prepared identically by the staff at South Quality.

Subsequently, a homogeneity study was conducted, verifying the time elapsed to the **first sign of corrosion** (**FSC**) and the **change in mass**, with an ISO 17025 accredited laboratory.

The control process followed ISO Guide 35: 2017, clause 7.4.1.2. Stratified random sampling was employed, and samples were chosen using random number generation software.

The results of this test are presented below:

Size of each batch: **100 samples**　　　Tested samples from each batch:　**20 samples**

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES - ORGANIC COATED METALLIC SHEET -		
	BATCH: LM1729	BATCH: LM1730	BATCH: LM1731
FSC	YES	YES	YES
Change in mass	YES	YES	YES

Size of each batch: **100 samples**　　　Tested samples from each batch:　**20 samples**

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES - GALVANIZED SHEET -		
	BATCH: LM2693	BATCH: LM2694	BATCH: LM2695
FSC	NO	NO	YES
Change in mass	NO	NO	YES

The samples for this program are taken from the selected batches identified as LM1731, and LM2695.

For the indicated batches, the values determined in the homogeneity study are utilized as the assigned values.

The analysis of the test data indicated that the selected samples exhibited sufficient homogeneity for the program. Therefore, the results of participants identified as outliers cannot be attributed to sample variability.

6. SAMPLE INFORMATION

The following samples were sent for testing:

Batch:	LM1731
Sample ID:	12 + 53 + 94
Characteristics:	Organic coated metallic sheet - 150x100x0.5 mm

Batch:	LM2695
Sample ID:	10 + 55 + 91
Characteristics:	Galvanized sheet - 150x100x0.7 mm

7. IMAGES

SAMPLES

8. ASSIGNED VALUES

PROPERTY	LM1731	LM2695
FSC (h):	Unaffected	12
CHANGE IN MASS (g/m²):	0.015	1.586
CHANGE IN MASS (SD):	0.030	0.185

9. PARTICIPANT RESULTS (See appendix)

PROPERTY	LM1731 - AVG	LM2695 - AVG
FSC (h):	- [1]	12
CHANGE IN MASS (g/m²):	0.009	1.869

[1] " - " (Dash) as the predominant result; corrosion observed in one sample, not considered in the average.

10. STATISTICS

The results must be treated as qualitative and quantitative.

According B.3.1.3 of ISO 17043 the appropriate technique is to compare participant results with the assigned values.

a) For the variable **FSC**, the comparison is made through the difference **D** (B1 - ISO 17043).

$$D = (x - X)$$

x is the participant's result

X is the assigned value

The performance evaluation is carried out with the following criteria:

$|D| \leq$ **12 h**   indicates "satisfactory" performance and generates no signal;

12 h $< |D| \leq$ **24 h**   indicates "questionable" performance and generates a warning signal;

$|D| >$ **24 h**   indicates "unsatisfactory" performance and generates an action signal;

In those samples where there is no degradation of the material, the result is treated as qualitative and must match with the assigned value to be considered **satisfactory**, otherwise, it is evaluated as **unsatisfactory**.

b) For the variable **CHANGE IN MASS** the comparison is made through z **score** (B3 - ISO 17043).

$$z = \frac{x - X}{\hat{\sigma}}$$

x is the participant's result

X is the assigned value

$\hat{\sigma}$ is the standard deviation

The performance evaluation is carried out with the following criteria:

$|z| \leq$ **2.0**   **indicates "satisfactory" performance and generates no signal;**

2.0 $< |z| <$ **3.0**   **indicates "questionable" performance and generates a warning signal;**

$|z| \geq$ **3.0**   **indicates "unsatisfactory" performance and generates an action signal;**

11. EVALUATION OF PERFORMANCE

BATCH	FSC (h)		PERFORMANCE RESULT
	PARTICIPANT RESULT	**ASSIGNED VALUE**	
LM1731	-	Unaffected	**SATISFACTORY**

BATCH	FSC (h)		$|D|$	PERFORMANCE RESULT
	PARTICIPANT RESULT	**ASSIGNED VALUE**		
LM2695	12	12	**0**	**SATISFACTORY**

BATCH	CHANGE IN MASS (g/m^2)		$|z$ score $|$	PERFORMANCE RESULT
	PARTICIPANT RESULT	**ASSIGNED VALUE**		
LM1731	0.009	0.015	**0.20**	**SATISFACTORY**
LM2695	1.869	1.586	**1.52**	**SATISFACTORY**

12. CONCLUSIONS

The overall performance on this **SQ-0056.V4** program from the participant laboratory **CERIMME - METALLURGY (Participant B)**, is **SUFFICIENT** based on expected results.

The criteria used for the evaluation of the overall performance is the following:

- **SUFFICIENT** performance: No unsatisfactory/questionable results were obtained.

- **ALMOST SUFFICIENT** performance: No unsatisfactory results were obtained, but one questionable result was found.

- **INSUFFICIENT** performance: An unsatisfactory result or two questionable results were obtained.

APPENDIX

PARTICIPANT RESULTS

(RESULTS FORM)

INSTRUCTIVE
&
RESULTS FORM

PROGRAM:	Salt spray test Neutral salt spray (NSS)
CODE:	SQ-0056
VERSION:	4
STANDARD:	ISO 9227
COORDINATOR:	Eng. Alfredo Schmidt (aschmidt@ptsouthquality.com)

1 - General

This document is intended to be filled with the results of the **SQ-0056.V4** program.

Results must be typed, not handwritten.

2 - Standard

ISO 9227: 2017

3 - Tests involved

TEST
Assessment of corrosion resistance of metallic materials (NSS)

4 - Samples

CODE	SAMPLE	QUANTITY
LM1731-XX	Organic coated metallic sheet - 150 x 100 x 0.5 [mm]	3
LM2695-XX	Galvanized sheet - 150 x 100 x 0.7 [mm]	3

5 - Notes

a) Being a bilateral program there is no deadline to accomplish sending results.
b) Tables in this document can be modified at will for the addition of data or observations.
c) The identification of the samples is located on the backside.
d) The samples must be kept until the end of the program, which closes with the submission of the final report.
e) To review the results, sending images of the tests will be appreciated. Images can be attached to the end of this document or inserted into your regular report.
f) Once this document is completed, it is requested to transform it into a pdf file and send it to the program coordinator.

6 - Preparation of tests specimens

a) Samples shall be properly cleaned. Care must be taken to ensure that the samples are not recontaminated after cleaning due to excessive or careless handling.

b) The back and cut edges shall be adequately protected by coating them with a suitable material that remains stable under the test conditions, such as paint, wax, or adhesive tape. The edges of the protective coating on the front face must be straight and parallel to the sample edges, leaving a rectangular area of the material exposed.

c) **(LM1731-XX samples only)** - Two scribe marks shall be made in accordance with ISO 17872 and must be at least 20 mm apart from each other and from any edge of the test samples. The scribe marks shall penetrate through the coating to the substrate and shall be parallel to the longer edge of the test samples.

d) Determine the exposed material area in cm² (**A**) and weigh the samples to the nearest 1 mg (**m1**). In the **LM1731-XX** samples, the exposed area corresponds to the area uncovered by the scribe marks

7 - Test conditions

Procedure:	According to standard
Duration of test:	168 h
Inspection frequency:	Max: 12 h
Parameter to determine:	First sign of corrosion (**FSC**)
Final measurement:	Weigh the specimens to the nearest 1 mg (**m2**)

8 - Test results

SAMPLE	A (cm²)	m1 (mg)	m2 (mg)	FSC (h)
LM1731-12	150.70	61565	61564	--
LM1731-53	151.20	61710	61707	--
LM1731-94	151.68	61657	61657	84h (White corrosion)
LM2695-10	152.40	86570	86314	12h (White corrosion)
LM2695-55	153.85	87451	87106	12h (White corrosion) 36 (red corrosion)
LM2695-91	1.52.52	86583	86326	12h (White corrosion)

10 - **Information and observations (According Clause 14)**

Clause	Information
b)	Analytical grade sodium chloride without additives, dissolved in demineralized water free from contaminants
e)	The samples are cleaned with demineralized water and a soft sponge, with edge and back protection applied using adhesive tape
h)	After the test, the specimens were cleaned using demineralized water and a soft brush. The loss in mass was measured and recorded to evaluate the extent of corrosion
i)	The tested surfaces were inclined at an angle of **20°** from the vertical
m)	35 °C ± 2 °C
n)	The volume of the collected solution was within the specified range of 1.0 to 2.0 mL/h
o)	The pH of the initial salt solution was between **6.0** and **7.0**, while the pH of the collected solution was between **6.5** and **7.2**
p)	The salt concentration of the solution was **50 ± 5 g/L**
r)	No abnormalities or incidents occurred during the entire test procedure
s)	12 h ± 2 h

OBSERVATIONS

PHOTOGRAPHS

LM1731-12

LM1731-53

LM1731-94

LM2695-10

LM2695-55

LM2695-91

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