SOUTH QUALITY

PROFICIENCY TESTING PROVIDER

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ISO 9227

SALT SPRAY TEST

Acetic Acid Salt Spray (AASS)

Program: SQO-M3 Round 14

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Prepared by:	Reviewed by:	Approved by:
cn=Mateo Giovanni, o=PT SOUTH QUALITY SAS, ou=SOUTH QUALITY, email=tech@ptsouthquality.com, c=AR 2025.12.16 16:11:21 -03'00'	cn=ERIKA BREST, o=PT SOUTH QUALITY SAS, ou=SOUTH QUALITY, email=ebrest@ptsouthquality.com, c=AR 2025.12.18 11:28:22 -03'00'	cn=Emiliano Medina, o=SOUTH QUALITY, ou=PT SOUTH QUALITY SAS, email=quality@ptsouthquality.com, c=ES 2025.12.18 17:14:28 -03'00'
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1. FOREWORD

This report summarizes the results of the **SQO-M3 Round 14** proficiency testing program on the determination of corrosion resistance of metallic materials. This program is carried out under a simultaneous participation format, according to the A.3.1 classification of the ISO 17043 standard ("Model 2 - Figure A.1").

South Quality conducted the testing program in October/November 2025. The aim of the program was to assess laboratory ability to competently perform the nominated tests.

2. ORGANIZATION

Program Coordinator:	Eng. Erika Brest
Assistant Technician:	Mateo Giovanni
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 using the following standard:

Standard
ISO 9227: 2017 + AMD 1: 2024 Acetic Acid Salt Spray (AASS)

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

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

As part of the standard practice in this program, three types of shipments are sent to participants during the annual rounds, which may take the following form:

i. Sample A (Corrosion-resistant) + Sample B (Corrosion-resistant).
ii. Sample A (Corrosion-resistant) + Sample B (Corrosion- susceptible).
iii. Sample A (Corrosion- susceptible) + Sample B (Corrosion- susceptible).

4. PARTICIPANTS

In the present round, 20 companies participated, as detailed below:

CODE	Country	ISO 17025 accredited	Results delivered
01	Netherlands	Yes	Yes
02	Canada	Yes	Yes
03	Malaysia	No	Yes
04	France	Yes	Yes
05	Spain	Yes	No
06	France	Yes	Yes
07	Italy	Yes	Yes
08	Spain	Yes	Yes
09	Portugal	Yes	Yes
10	Chile	No	Yes
11	England	Yes	Yes
12	Italy	Yes	Yes
13	Mexico	Yes	No
14	Türkiye	Yes	Yes
15	Argentina	No	No
16	Colombia	Yes	Yes
17	Australia	Yes	Yes
18	Thailand	Yes	Yes
19	Pakistan	No	No
20	Brazil	Yes	Yes

5. HOMOGENEITY

Several batches were prepared by South Quality personnel in an identical way.

Then, a homogeneity study was carried out, 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 33405: 2024, clauses 7.4.1.1 / 7.4.1.2. Stratified random sampling was applied. Samples were selected using random number generation software.

The results of this test appear below:

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

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES - GALVANIZED SHEET -		
	BATCH: LM3130	BATCH: LM3131	BATCH: LM3132
FSC	YES	NO	YES
Change in mass	YES	NO	YES

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES - BOLTS -		
	BATCH: LM3283	BATCH: LM3284	BATCH: LM3285
FSC	YES	YES	YES
Change in mass	NO	NO	YES

Samples for this program are taken from selected batches identified as **LM3130** and **LM3285**.

Analysis of this testing data indicated that samples were sufficiently homogeneous for the program and, therefore, any participant results identified as outliers cannot be attributed to sample variability.

6. SAMPLE INFORMATION

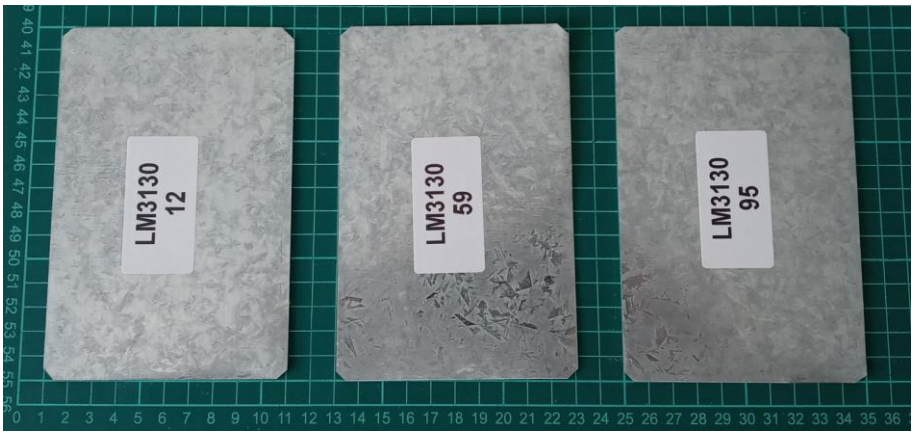
The following samples were sent for testing (Participant **Code 20**):

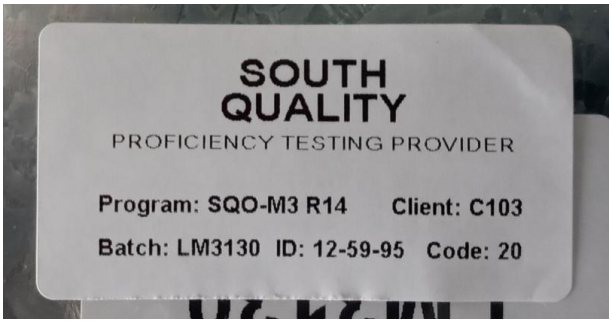
Batch:	LM3130
Sample ID:	12 + 59 + 95
Characteristics:	Metallic coated sheet - 150 x 100 x 0.7 mm

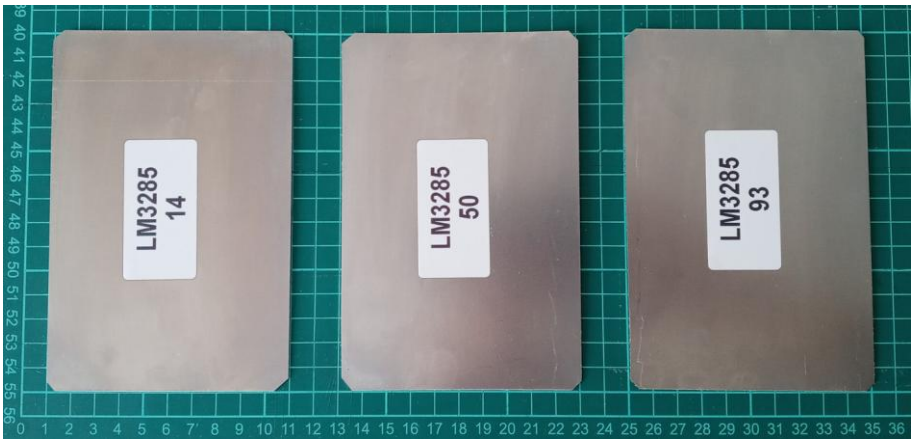
Batch:	LM3285
Sample ID:	14 + 50 + 93
Characteristics:	Metallic sheet - 150 x 100 x 0.7 mm

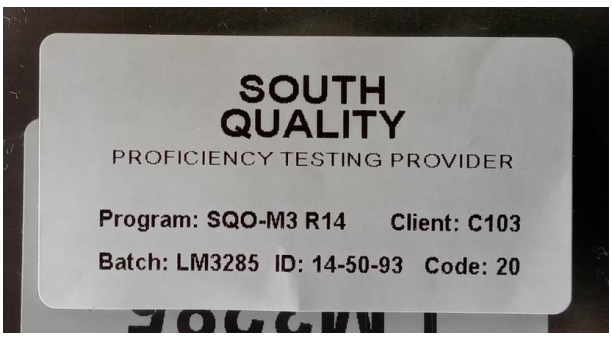
7. IMAGES

SAMPLES









8. ASSIGNED VALUES

The assigned values are obtained from the results reported by all participants (**Consensus values**).

For the **FSC** parameter, only the appearance of white rust will be considered. Red rust is excluded from this evaluation.

9. PARTICIPANTS RESULTS

LABORATORY CODE	LM3130			LM3285		
	SAMPLE	FSC - AVG (h)	CHANGE IN MASS AVG (g/m²)	SAMPLE	FSC - AVG (h)	CHANGE IN MASS AVG (g/m²)
01	25 + 55 + 87	24	-33.85	31 + 65 + 72	24	-86.22
02	21 + 36 + 83	24	-36.25	07 + 48 + 79	24	-88.29
03	30 + 41 + 84	24	-34.78	22 + 41 + 95	24	-91.83
04	14 + 37 + 80	24	-48.48	16 + 59 + 84	24	-87.60
06	27 + 42 + 96	24	-25.61	27 + 36 + 97	24	-90.84
07	24 + 46 + 68	24	-22.74	04 + 62 + 70	24	-98.61
08	10 + 50 + 89	24	-34.57	32 + 45 + 91	24	-100.92
09	05 + 43 + 79	48	-31.41	19 + 55 + 76	24	-85.16
10	18 + 57 + 76	24	-27.32	09 + 39 + 99	24	-102.45
11	04 + 38 + 93	24	-36.76	25 + 60 + 82	24	-96.14
12	06 + 44 + 77	24	-29.25	02 + 49 + 68	24	-102.67
14	22 + 54 + 72	24	-27.92	30 + 42 + 87	24	-99.43
16	02 + 62 + 88	24	-17.62	13 + 64 + 94	24	-70.25
17	32 + 66 + 99	24	-30.95	06 + 35 + 100	24	-87.94
18	15 + 56 + 90	24	-33.07	11 + 52 + 88	24	-93.62
20	12 + 59 + 95	24	-21.20	14 + 50 + 93	24	51.92

ASSIGNED VALUES			
PROPERTY	**LM3130**	**PROPERTY**	**LM3285**
FSC (h):	24	**FSC (h):**	24
CHANGE IN MASS (g/m²):	- 29.55	**CHANGE IN MASS (%):**	- 93.69
CHANGE IN MASS (SD):	5.778	**CHANGE IN MASS (SD):**	6.277

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

LABORATORY CODE	LM3130		LM3285	
	FSC - AVG (h / Unaffected)	$\|D\|$	FSC - AVG (h / Unaffected)	$\|D\|$
01	24	0	24	0
02	24	0	24	0
03	24	0	24	0
04	24	0	24	0
06	24	0	24	0
07	24	0	24	0
08	24	0	24	0
09	48	24	24	0
10	24	0	24	0
11	24	0	24	0
12	24	0	24	0
14	24	0	24	0
16	24	0	24	0
17	24	0	24	0
18	24	0	24	0
20	24	0	24	0

LABORATORY CODE	LM3130		LM3285	
	CHANGE IN MASS - AVG (g/m^2)	| z score |	CHANGE IN MASS - AVG (g/m^2)	| z score |
01	-33.85	0.7	-86.22	1.2
02	-36.25	1.2	-88.29	0.9
03	-34.78	0.9	-91.83	0.3
04	-48.48	3.3 ¤	-87.60	1.0
06	-25.61	0.7	-90.84	0.5
07	-22.74	1.2	-98.61	0.8
08	-34.57	0.9	-100.92	1.2
09	-31.41	0.3	-85.16	1.4
10	-27.32	0.4	-102.45	1.4
11	-36.76	1.2	-96.14	0.4
12	-29.25	0.1	-102.67	1.4
14	-27.92	0.3	-99.43	0.9
16	-17.62	2.1	-70.25	3.7 ¤
17	-30.95	0.2	-87.94	0.9
18	-33.07	0.6	-93.62	0.0
20	-21.20	1.4	51.92	23.2 ¤

Laboratory **Code 01**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 02**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 03**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 04**: The laboratory obtained an **UNSATISFACTORY** result in the determination of **FSC** in the LM3130 batch; however, the results for the remaining parameters were **SATISFACTORY**.

Laboratory **Code 05**: The laboratory did not submit the results before the deadline.

Laboratory **Code 06**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 07**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 08**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 09**: The laboratory obtained a **QUESTIONABLE** result in the determination of **FSC** in the LM3130 batch; however, the results for the remaining parameters were **SATISFACTORY**.

Laboratory **Code 10**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 11**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 12**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 13**: The laboratory did not submit the results before the deadline.

Laboratory **Code 14**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 15**: The laboratory did not submit the results before the deadline.

Laboratory **Code 16**: The laboratory obtained an **UNSATISFACTORY** result in the determination of **change in mass** in the LM3285 batch and a **QUESTIONABLE** result for the LM3130 batch; however, the results for the remaining parameters were **SATISFACTORY**.

Laboratory **Code 17**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 18**: The laboratory obtained **SATISFACTORY** results in the determination of all parameters.

Laboratory **Code 19**: The laboratory did not submit the results before the deadline.

Laboratory **Code 20**: The laboratory obtained an **UNSATISFACTORY** result in the determination of **change in mass** in the LM3285 batch; however, the results for the remaining parameters were **SATISFACTORY**.

12. CONCLUSIONS

The overall performance on this **SQO-M3 Round 14** program from the participating laboratories, based on expected results, are the following:

- Laboratory Codes **01, 02, 03, 06, 07, 08, 10, 11, 12, 14, 17,** and **18** have obtained a **SUFFICIENT** performance in accordance with the expected results and should not take action;

- Laboratory Code **09** has obtained an **ALMOST SUFFICIENT** performance in accordance with the expected results and must evaluate whether corrective action is necessary;

- Laboratory Codes **04, 16,** and **20** have obtained an **INSUFFICIENT** performance in accordance with the expected results and must take corrective action (See Appendix B).

The criteria used for the evaluation of the overall performance are as follows:

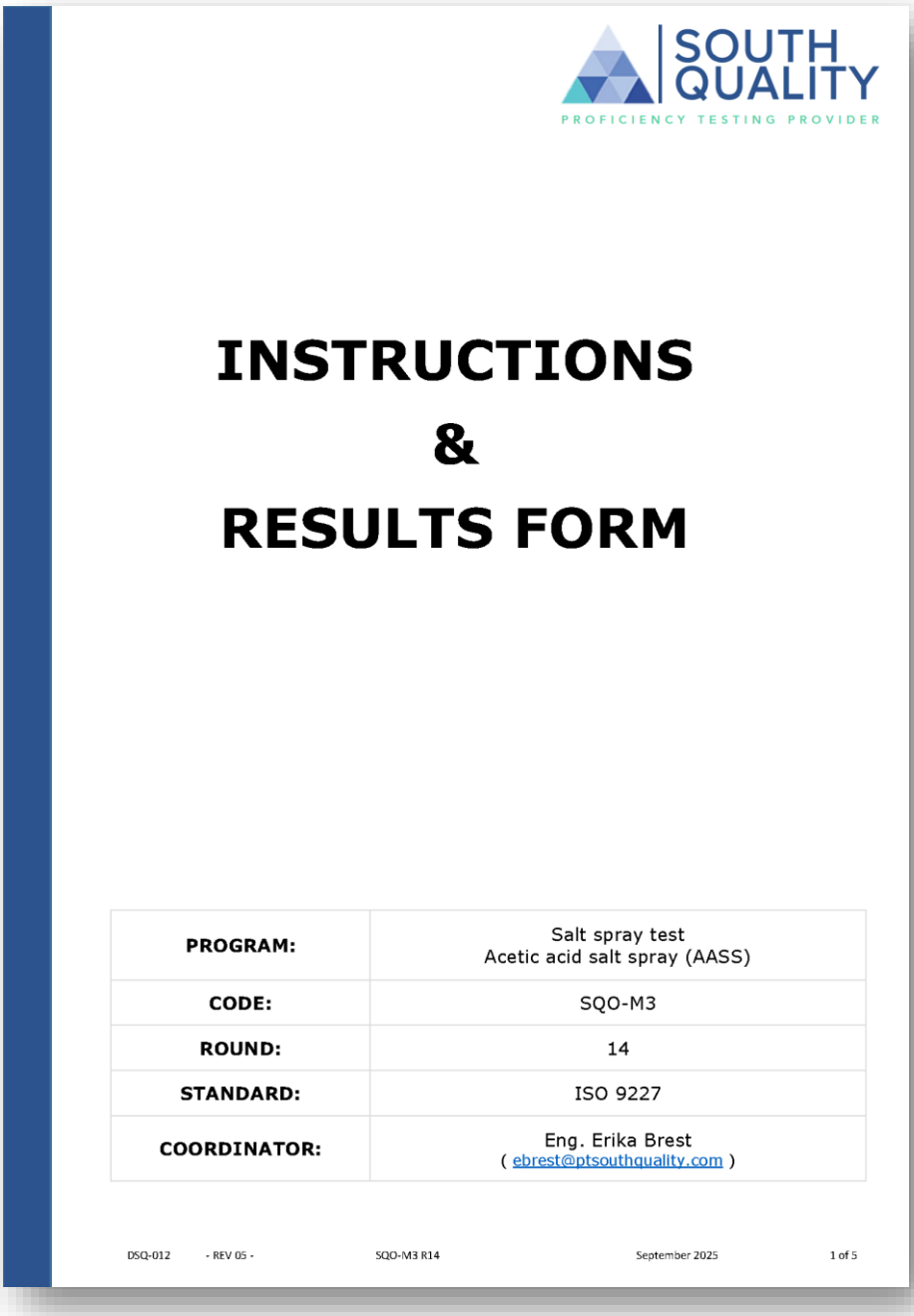
- **SUFFICIENT** performance: No unsatisfactory or questionable results were obtained.
- **ALMOST SUFFICIENT** performance: No unsatisfactory results were obtained, but one questionable result was found.
- **INSUFFICIENT** performance: At least one unsatisfactory result or two questionable results were obtained.

APPENDIX A

A1 - PARTICIPANT DATA

Company:	**MARCOPOLO SA**
Laboratory:	**MARCOPOLO**
Country:	Brazil
Client ID:	C103
Contact person:	Débora Aver - Engenheiro(a) de Avaliação e Teste (debora.aver@marcopolo.com.br)

A2 - PARTICIPANT RESULTS



SOUTH QUALITY
PROFICIENCY TESTING PROVIDER

INSTRUCTIONS
&
RESULTS FORM

PROGRAM:	Salt spray test Acetic acid salt spray (AASS)
CODE:	SQO-M3
ROUND:	14
STANDARD:	ISO 9227
COORDINATOR:	Eng. Erika Brest (ebrest@ptsouthquality.com)

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1 - General

This document is intended to be filled with the results of the **SQO-M3 (Round 14)** program.

Results must be typed, not handwritten.

2 - Standard

ISO 9227: 2022 + AMD1: 2024

3 - Participant

MARCOPOLO SA	CODE 20

4 - Tests involved

TEST
Assessment of corrosion resistance of metallic materials

5 - Samples

CODE	SAMPLE	QUANTITY
LM3130-XX	Metallic coated sheet - 150 x 100 x 0.7 mm	3
LM3285-19	Metallic sheet - 150 x 100 x 0.7 mm	3

6 - Notes

a) The deadline for submitting the results is **November 25, 2025**.
b) The tables in this document may be modified by the participant, if desired, to include data or observations.
c) The samples are to be handled as routine lab samples, with all testing, documentation, and reporting adhering to **ISO 9227**.
d) The identification of the samples is located on the backside.
e) Samples must be retained until the end of the program, which concludes with the submission of the final report.
f) To review the results, the submission of images of the tests is appreciated. These images can be attached at the end of this document or sent via email.
g) Upon completion of this document, please convert it to a PDF file and send it to the program coordinator.

7 - **Preparation of tests specimens**

a) The samples must be adequately cleaned, and caution must be exercised to prevent recontamination from excessive or careless handling after cleaning.

b) The backside and cut edges should 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 protective coating along the front face edges must be straight and parallel to the sample's edges, leaving a rectangle of the material exposed.

c) Determine the area of exposed material in cm^2 (**A**) and weigh the samples to the nearest 1 mg (**m1**).

8 - **Test conditions**

Procedure:	According to standard
Duration of test:	168 h
Inspection frequency:	24 h
Parameter to determine:	First sign of corrosion (**FSC**) + Mass change
Final measurement:	Weigh the specimens to the nearest 1 mg (**m2**)

9 - **Test results**

ID	A (cm^2)	m1 (mg)	m2 (mg)	FSC (h)
LM3130-12	124,40	84901	84718	24
LM3130-59	130,64	85914	85580	24
LM3130-95	131,13	85629	85323	24

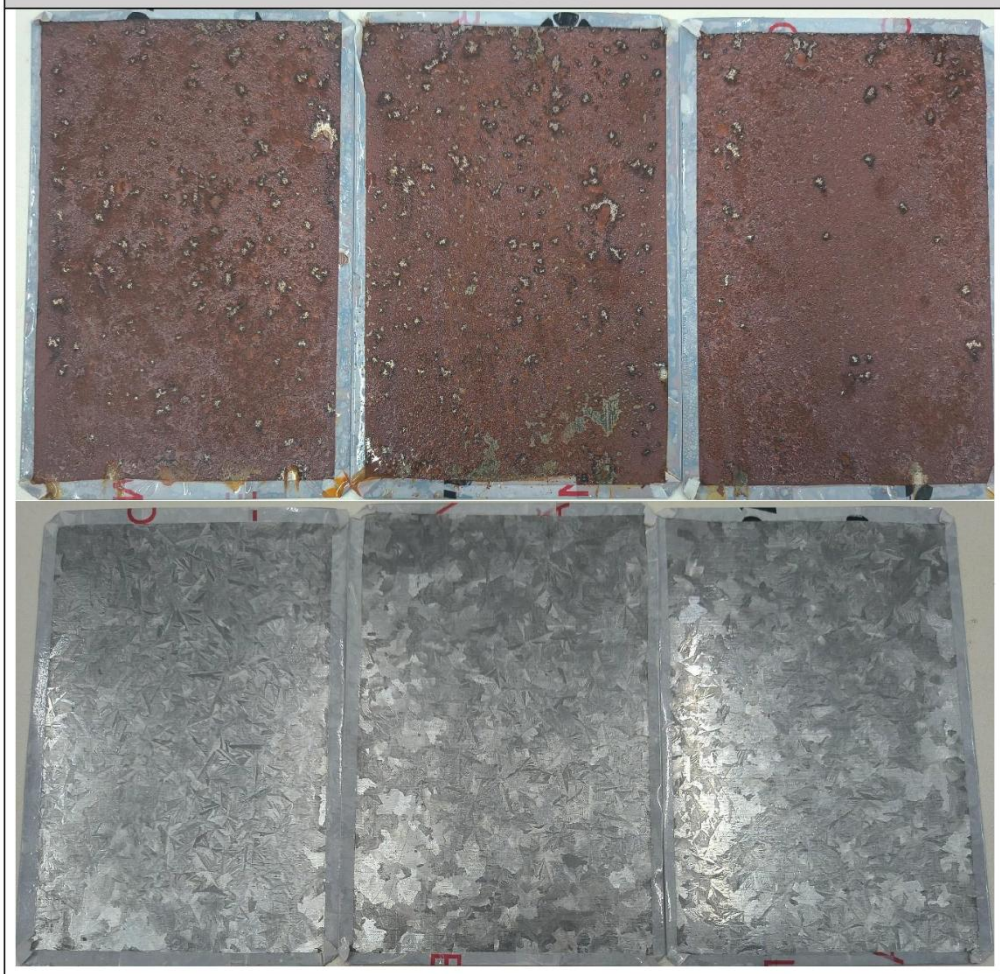
ID	A (cm^2)	m1 (mg)	m2 (mg)	FSC (h)
LM3285-14	128,31	80696	81289	24
LM3285-50	129,72	81792	82584	24
LM3285-93	127,4	82192	82810	24

10 - **Information and observations (According Clause 14.2)**

Cl.	Information
b)	Maximum conductivity of 5 µS/cm for deionized water. The sodium chloride used for the solution had a maximum total impurity of 0,3%, halides (other than chloride) were present in less than 0,1% by mass, the amount of copper was less than 0,3 ppm by mass, and it did not contain anti-caking agents.
e)	Clean with a clean, dry cloth and protect the edges and back with tape.
h)	Clean with running water at the end of the test.
i)	Angle of 15º to 25º with the vertical.
m)	Saturator temperature between 46,2°C and 48,8°C and chamber temperature between 32,2°C and 36,8°C
n)	Volume collected between 1 and 2 mL/h
o)	pH of the collected solution between 3,15 and 3,25. pH of the test solution between 3,10 and 3,18
p)	Concentration of the collected solution between 4,3% and 5,7%
r)	Without deviations or incidents.
s)	Evaluation every 24 hours.

OBSERVATIONS

PHOTOGRAPHS



APPENDIX B

FINDINGS

When an interlaboratory study is conducted, the findings are derived from the evaluation of the practices, procedures, and results of all participating laboratories.

Any identified differences in the testing process may be reported in this report.

Where an insufficient result is obtained, laboratories shall address the identified areas for improvement to ensure compliance with applicable quality requirements and to maintain the integrity of the results, in accordance with the applied standard or test method.

Laboratories are therefore expected to implement appropriate corrective actions to improve their performance in future rounds.

Based on the data provided in accordance with Clause 14, the following differences in the test method reported by participant code 20 (Batch LM3285) have been observed:

Clause	Laboratory **CODE 20**	Mosts participants (*)
(h)	Clean with running water	Chemical cleaning (ISO 8407 - Table A.1)

(*) Participants with insufficient performance are excluded from the evaluation.

The findings mentioned refer solely to differences observed among the results provided by the participants. They do not imply, in any way, that the participant's insufficient result is attributable to these difference(s).

The participant shall internally analyze any deviations that may have occurred during testing.

----- END OF REPORT -----