# REPORT No 11507

***Date of issue:*** *December 16, 2025*

***Status: FINAL REPORT***

**********

# ISO 9227

# SALT SPRAY TEST

# Acetic Acid Salt Spray (AASS)

# Program: SQO-M3 Round 14

**********



| Prepared by: | Reviewed by: | Approved by: |
|---|---|---|
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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<br>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

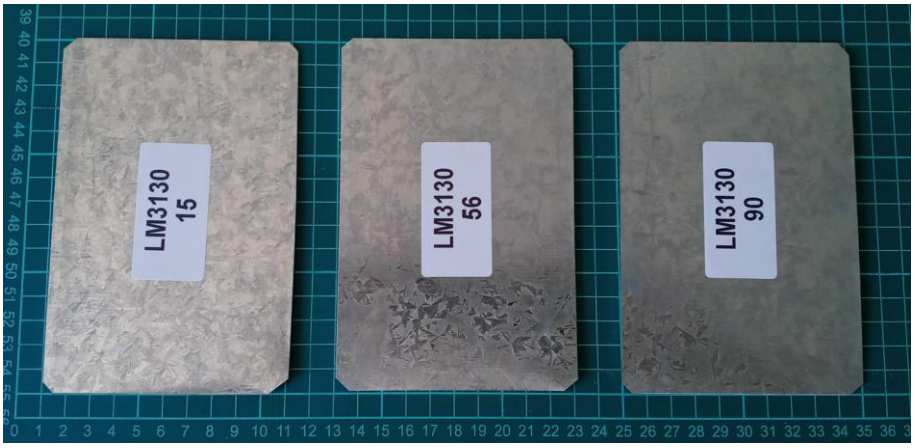
The following samples were sent for testing (Participant **Code 18**):

| | |
|---|---|
| Batch: | LM3130 |
| Sample ID: | 15 + 56 + 90 |
| Characteristics: | Metallic coated sheet - 150 x 100 x 0.7 mm |

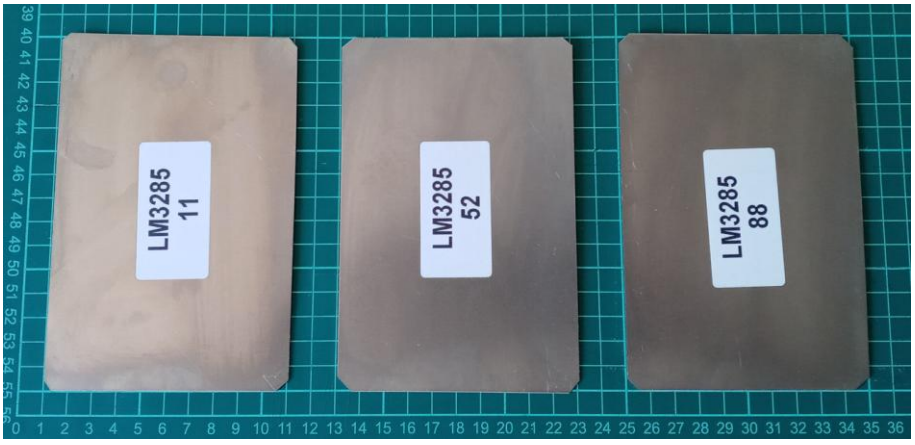
| | |
|---|---|
| Batch: | LM3285 |
| Sample ID: | 11 + 52 + 88 |
| Characteristics: | Metallic sheet - 150 x 100 x 0.7 mm |

## 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:

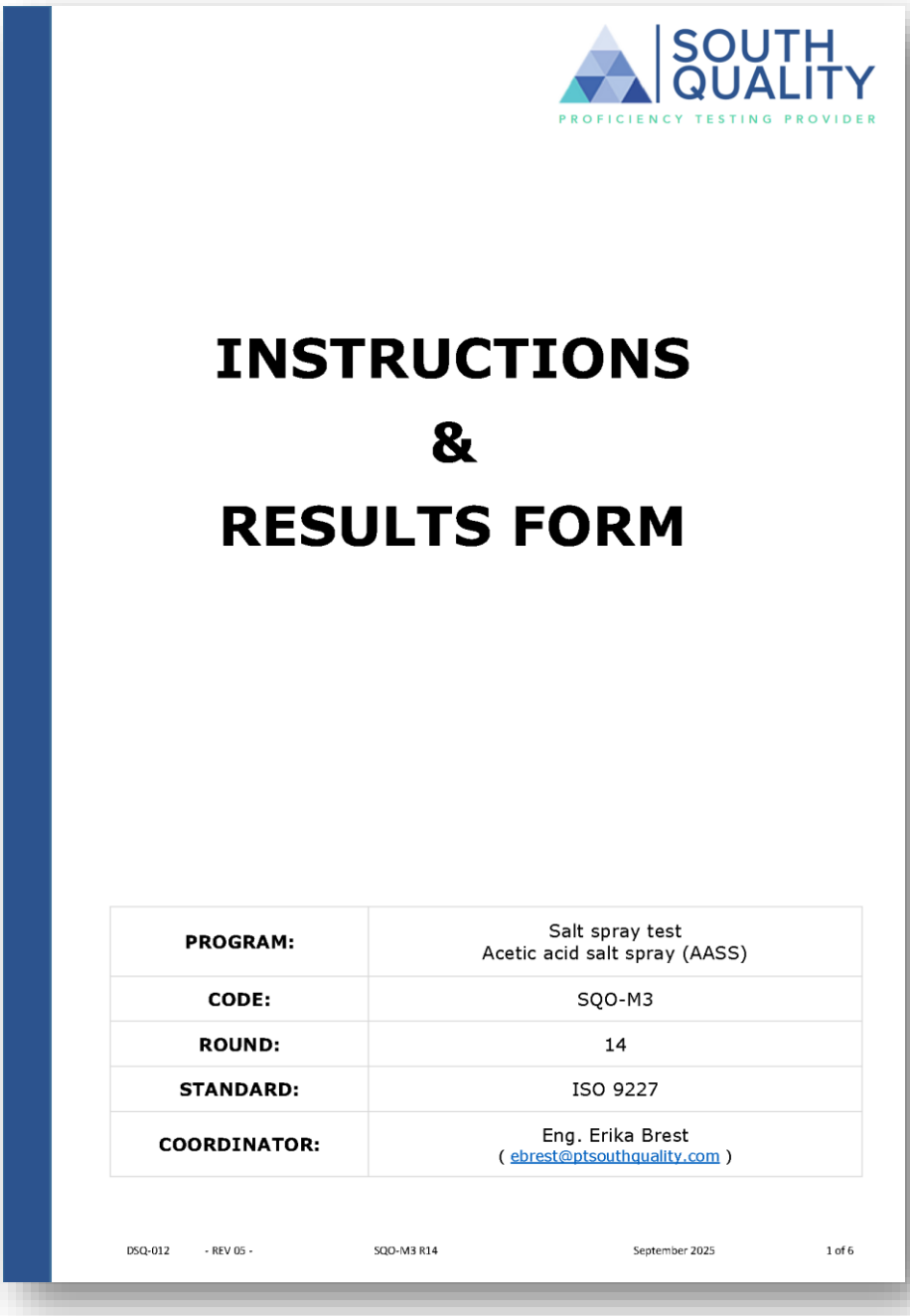
- **SUFFICIENT** performance: No unsatisfactory or questionable results were obtained.
- **ALMOST SUFFICIENT** performance: No unsatisfactory results were obtained, but one questionable result was found.
- **INSUFFICIENT** performance: At least one unsatisfactory result or two questionable results were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

# APPENDIX A

## A1 - PARTICIPANT DATA

| | |
|---|---|
| Company: | **TÜV SÜD (Thailand) Limited** |
| Laboratory: | **TÜV SÜD (THAILAND) LIMITED - AMATA CITY CHONBURI BRANCH** |
| Country: | Thailand |
| Client ID: | S357 |
| Contact person: | Watcharin Khamsiri<br>( watcharin.k@tuvsud.com ) |

## A2 - PARTICIPANT RESULTS



SOUTH QUALITY
PROFICIENCY TESTING PROVIDER

**INSTRUCTIONS**
**&**
**RESULTS FORM**

| | |
|---|---|
| **PROGRAM:** | Salt spray test<br>Acetic acid salt spray (AASS) |
| **CODE:** | SQO-M3 |
| **ROUND:** | 14 |
| **STANDARD:** | ISO 9227 |
| **COORDINATOR:** | Eng. Erika Brest<br>( 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

| TÜV SÜD (THAILAND) LIMITED | CODE 18 |
|---|---|

## 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-XX | 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 ) |
|---|---|---|---|---|
| **LM3130-15** | 150 | 85939 | 85464 | 24 |
| **LM3130-56** | 150 | 85909 | 85399 | 24 |
| **LM3130-90** | 150 | 85164 | 84661 | 24 |

| ID | A ( $cm^2$ ) | m1 ( mg ) | m2 ( mg ) | FSC ( h ) |
|---|---|---|---|---|
| **LM3285-11** | 150 | 81294 | 79895 | 24 |
| **LM3285-52** | 150 | 82147 | 80745 | 24 |
| **LM3285-88** | 150 | 82057 | 80645 | 24 |

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

| Cl. | Information |
|---|---|
| b) | Sodium chloride Grade AR , Di water |
| e) | Wax edges |
| h) | Metallic coated sheet - 150 x 100 x 0.7 mm , Metallic sheet - 150 x 100 x 0.7 mm |
| i) | 20° |
| m) | 35 degrees |
| n) | 1.8ml/h |
| o) | PH 3.3 |
| p) | 50g/L |
| r) | - |
| s) | 24 Hr. |

| OBSERVATIONS |
|---|
| |

**PHOTOGRAPHS**

| | |
|---|---|
|  |  |
| **LM3130-15** | **LM3130-15** |
|  |  |
| **LM3130-56** | **LM3130-56** |
|  |  |
| **LM3130-90** | **LM3130-90** |


LM3285-11


LM3285-11


LM3285-52


LM3285-52


LM3285-88


LM3285-88

# APPENDIX B

# VOID

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