SOUTH QUALITY

PROFICIENCY TESTING PROVIDER

# REPORT No 11496

***Date of issue:*** *December 17, 2025*

***Status: FINAL REPORT***

**********

# IEC 60754-2

## TEST ON GASES EVOLVED DURING COMBUSTION OF MATERIALS FROM CABLES DETERMINATION OF ACIDITY (BY pH MEASUREMENT) AND CONDUCTIVITY

## Program: SQ-2501

**********



| Prepared by: | Reviewed by: | Approved by: |
|---|---|---|
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## 1. FOREWORD

This report summarizes the results of the **SQ-2501** proficiency testing program for determining the corrosivity potential of gases emitted during the combustion of electric cables. 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 2025 with the aim of assessing the laboratory's ability to competently perform the designated 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 pH and conductivity values using the following standard:

| Standard |
|---|
| IEC 60754-2: 2011 + AMD 1: 2019 |

To verify this, batches of cables have been selected.

Participants in this program have not been previously informed about the expected behavior of the samples they receive.

## 4. PARTICIPANT

| | |
|---|---|
| Company: | **ELECTRIC PRODUCTS CERTIFICATION INDEPENDENT BODY - OICPE** |
| Laboratory: | **TESTING LABORATORY FOR ELECTRICAL PRODUCTS CERTIFICATION - LICPE** |
| Country: | Romania |
| Client ID: | E478 |
| Contact person: | Razvan Neacsu<br>Quality Manager<br>razvan.neacsu@oicpe.ro |

## 5. HOMOGENEITY

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

Subsequently, a homogeneity study was conducted 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, and samples were selected using random number generation software.

The results of this test are presented below:

Size of each batch: **50 units** Tested samples from each batch: **15 units**

| DETERMINATION | SHEATH - HOMOGENEITY OF RESULTS IN THE SAMPLES ANALYZED | | |
|---|---|---|---|
| | BATCH: LEM1843 | BATCH: LEM1844 | BATCH: LEM1845 |
| pH | YES | YES | NO |
| CONDUCTIVITY | YES | YES | NO |

Size of each batch: **50 units** Tested samples from each batch: **15 units**

| DETERMINATION | SHEATH - HOMOGENEITY OF RESULTS IN THE SAMPLES ANALYZED | | |
|---|---|---|---|
| | BATCH: LEM1916 | BATCH: LEM1917 | BATCH: LEM1918 |
| pH | YES | NO | YES |
| CONDUCTIVITY | YES | NO | YES |

The samples for this program are taken from the selected batches identified as **LEM1844** and **LEM1918**.

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:

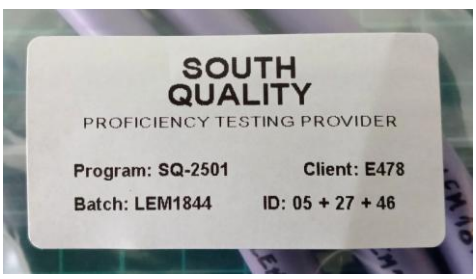
| | |
|---|---|
| Batch: | LEM1844 |
| Sample ID: | 05 + 27 + 46 |
| Characteristics: | Round cable - 2 x 1.5 mm2 - 10 cm |

| | |
|---|---|
| Batch: | LEM1918 |
| Sample ID: | 12 + 26 + 49 |
| Characteristics: | Round cable - 2 x 1.5 mm2 - 10 cm |

## 7. IMAGES

**SAMPLES**






## 8. ASSIGNED VALUES

| BATCH: LEM1844 | | |
|---|---|---|
| **PROPERTY** | **RESULT - AVG** | **SD** |
| **pH** | 2.72 | 0.09 |
| **Conductivity (µS/mm)** | 274.12 | 0.98 |

| BATCH: LEM1918 | | |
|---|---|---|
| **PROPERTY** | **RESULT - AVG** | **SD** |
| **pH** | 2.82 | 0.02 |
| **Conductivity (µS/mm)** | 178.89 | 1.15 |

## 9. PARTICIPANT RESULTS (SEE APPENDIX B)

| BATCH: LEM1844 | |
|---|---|
| **PROPERTY** | **RESULT - AVG** |
| **pH** | 2.69 |
| **Conductivity (µS/mm)** | 272.9 |

| BATCH: LEM1918 | |
|---|---|
| **PROPERTY** | **RESULT - AVG** |
| **pH** | 2.80 |
| **Conductivity (µS/mm)** | 177.5 |

## 10. STATISTICS

The results must be treated as quantitative.

For quantitative results the comparison is made according B.3.1.3 of ISO 17043 and the appropriate technique is to compare participant results with the assigned values. The results can be compare using percent difference ***z score***.

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

$x$ is the participant's result

$X$ is the assigned value

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

The performance evaluation of each sample 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

| PROPERTY | BATCH: LEM1844 | | \| z score \| | PERFORMANCE RESULT |
|---|---|---|---|---|
| | PARTICIPANT RESULT | ASSIGNED VALUE | | |
| pH | 2.69 | 2.72 | **0.33** | **SATISFACTORY** |
| CONDUCTIVITY (µS/mm) | 272.9 | 274.12 | **1.24** | **SATISFACTORY** |

| PROPERTY | BATCH: LEM1918 | | \| z score \| | PERFORMANCE RESULT |
|---|---|---|---|---|
| | PARTICIPANT RESULT | ASSIGNED VALUE | | |
| pH | 2.80 | 2.82 | **1.00** | **SATISFACTORY** |
| CONDUCTIVITY (µS/mm) | 177.5 | 178.89 | **1.21** | **SATISFACTORY** |

## 12. CONCLUSIONS

The overall performance of this **SQ-2501** program from the participant laboratory **ELECTRIC PRODUCTS CERTIFICATION INDEPENDENT BODY - OICPE - TESTING LABORATORY FOR ELECTRICAL PRODUCTS CERTIFICATION - LICPE**, is **SUFFICIENT** based on expected results.

The criteria used for evaluating the overall performance are as follows:

- **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 was obtained or two questionable results were obtained.

# APPENDIX A

## INSTRUCTIONS

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# INSTRUCTIONS

| | |
|---|---|
| **PROGRAM:** | Test on gases evolved during combustion of materials from cables<br>- Determination of acidity (by pH measurement) and conductivity - |
| **CODE:** | SQ-2501 |
| **VERSION:** | - |
| **STANDARD:** | IEC 60754-2 |
| **COORDINATOR:** | Eng. Erika Brest<br>( ebrest@ptsouthquality.com ) |

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## 1 - General

This document serves as a guide for managing the results of the **SQ-2501** program.

## 2 - Standard

**IEC 60754-2: 2011 + AMD 1: 2019**

## 3 - Tests involved

| TEST |
|---|
| Determination of the potential corrosivity of gases evolved during the combustion of electric cables |

## 4 - Samples

| CODE | SAMPLE | QUANTITY |
|---|---|---|
| LEM1843-XX | Round cable - 2 x 1.5 mm2 - 10 cm | 3 |
| LEM1918-XX | Round cable - 2 x 1.5 mm2 - 10 cm | 3 |

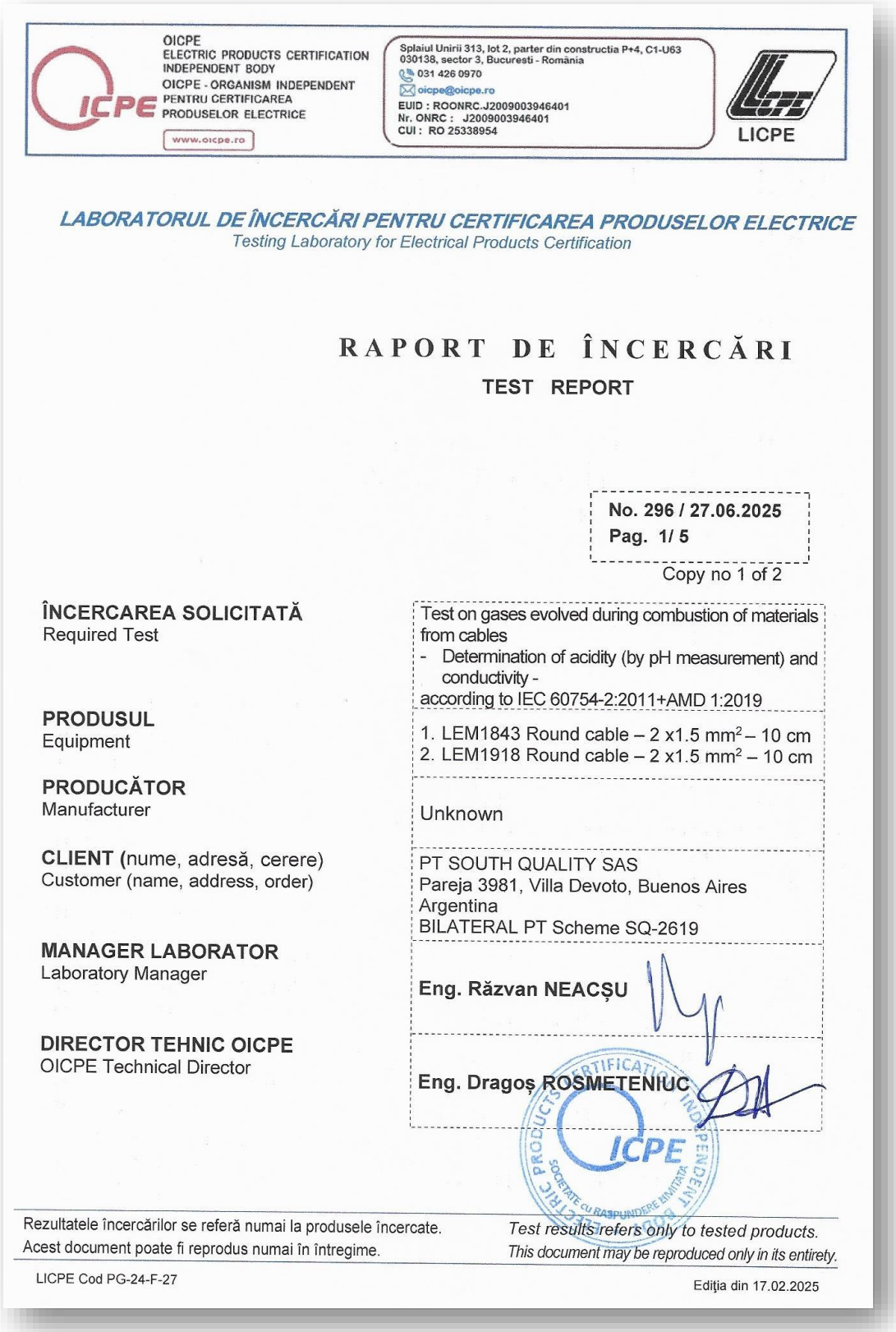
## 5 - Notes

**a)** Being a bilateral program there is no deadline to accomplish sending results.
**b)** The participant must submit the results using the usual report employed by their laboratory.
**c)** Samples must be retained until the end of the program, which concludes with the submission of the final report.
**d)** To review the results, test images would be appreciated. Images can be attached at the end of this document or sent by email.

**PHOTOGRAPHS**

# APPENDIX B

## PARTICIPANT RESULTS (TEST REPORT # 296/2025)



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LICPE

*LABORATORUL DE ÎNCERCĂRI PENTRU CERTIFICAREA PRODUSELOR ELECTRICE*
*Testing Laboratory for Electrical Products Certification*

RAPORT DE ÎNCERCĂRI
TEST REPORT

**No. 296 / 27.06.2025**
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| | |
|---|---|
| **ÎNCERCAREA SOLICITATĂ**<br>Required Test | Test on gases evolved during combustion of materials from cables<br>- Determination of acidity (by pH measurement) and conductivity -<br>according to IEC 60754-2:2011+AMD 1:2019 |
| **PRODUSUL**<br>Equipment | 1. LEM1843 Round cable – 2 x1.5 $mm^2$ – 10 cm<br>2. LEM1918 Round cable – 2 x1.5 $mm^2$ – 10 cm |
| **PRODUCĂTOR**<br>Manufacturer | Unknown |
| **CLIENT** (nume, adresă, cerere)<br>Customer (name, address, order) | PT SOUTH QUALITY SAS<br>Pareja 3981, Villa Devoto, Buenos Aires<br>Argentina<br>BILATERAL PT Scheme SQ-2619 |
| **MANAGER LABORATOR**<br>Laboratory Manager | **Eng. Răzvan NEACȘU** |
| **DIRECTOR TEHNIC OICPE**<br>OICPE Technical Director | **Eng. Dragoș ROSMETENIUC** |

Rezultatele încercărilor se referă numai la produsele încercate.
Acest document poate fi reprodus numai în întregime.

*Test results refers only to tested products.*
*This document may be reproduced only in its entirety.*

LICPE Cod PG-24-F-27

Ediţia din 17.02.2025

## PRODUCT TECHNICAL DATA:

1. LEM1843 Round cable – 2 x 1.5 mm² – 10 cm
2. LEM1918 Round cable – 2 x 1.5 mm² – 10 cm

| | |
|---|---|
| Drum no. | ---------- |
| Product sort | : samples |
| Product Reception date | : 08.08.2025 |
| Test period | : 15 … 26.09.2025 |
| Sampling method | : Unknown. The product was submitted by the test applicant |
| Number of tested products | : 2 (1 and 2) with 3 samples of each one as follows:<br>1.1.LEM1843-05<br>1.2.LEM1843-48<br>1.3.LEM1843-27<br>and<br>2.1. LEM1918-12<br>2.2. LEM1918-46<br>2.3. LEM1918-29 |

| | | |
|---|---|---|
| Tested by | Physicist Eng. Gabriel CONSTANTINESCU | |

| Article from ND | Requirement according to IEC 60754-2:2011+AMD 1:2019 | Results | Requirement fulfilling |
|---|---|---|---|
| **Test on gases evolved during combustion of materials from cables. Determination of acidity (by pH measurement) and conductivity.** | | | |
| **Test method: IEC 60754-2:2011+AMD 1:2019** | | | |
| **Conditioning** | | | |
| | - durată: minim 16 h | 22 h | P |
| | - temperatură: (23 ± 2) $^0$C | 24 $^0$C | P |
| | - umiditatea relativă: (50 ± 5) % | 50 % | P |
| **Heating procedure** | | | |
| | Temperature inside the quartz tube where the nacelle containing the test specimen is located: 935÷965 °C | Measured temperature: 950 °C. | P |
| | Temperature at the limit of the heating zone: >900 °C | Measured temperature: 912 °C | P |
| | Sample burning time:(30±1) min | Performed sample burning time:30 min | P |
| | pH and conductivity measurement | The pH and conductivity values (see Table 1.2 and 2.2) are the result of *n* (min. three) tests, performed on each material of each sample. | P |
| **Evaluation of the test results** | | | |
| | General method | The mean values and standard deviation values were determined for the results of the *n* tests (minimum three) conducted on each of the non-metallic materials in the cable structure. | P |
| **Weighting of values** | | | |
| | pH weighted value [pH'] | See Test Report<br>Table 1.1 – Test results of LEM-1844<br>Table 2.1 – Test results of LEM-1918 | P |
| | Weighted value [c'] for conductivity | | |
| **Performance requirements** | | | |
| **Annex A**: Recommended performance requirements in the absence of a particular specification: | | | |
| **A.1 Cable weighted value** | | | |
| | Weighted pH value: $pH' \geq 4,3$ | LEM1843-05: *pH'* = 2.72 < 4.3; | See Table 1.1 NP |
| | | LEM1843-48: *pH'* = 2.67 < 4.3; | NP |
| | | LEM1843-27: *pH'* = 2.75 < 4.3; | NP |
| | | LEM1918-12: *pH'* = 2.87 < 4.3; | See Table 2.1 NP |
| | | LEM1918-46: *pH'* = 2.84 < 4.3; | NP |
| | | LEM1918-29: *pH'* = 2.91 < 4.3; | NP |
| | Weighted conductivity value: $c' \leq 10$ µS/mm | LEM1843-05: *c'=255.84 µS/mm >10 µS/mm* | See Table 1.1 NP |
| | | LEM1843-48: *c'=252.08 µS/mm >10 µS/mm* | NP |
| | | LEM1843-27: *c'=258.12 µS/mm >10 µS/mm* | NP |
| | | LEM1918-12: *c'=144.85 µS/mm >10 µS/mm* | See Table 2.1 NP |
| | | LEM1918-46: *c'=143.30 µS/mm >10 µS/mm* | NP |
| | | LEM1918-29: *c'=146.41 µS/mm >10 µS/mm* | NP |
| **A.2 Material value** | | | |
| | Sheath pH value: $pH \geq 4,3$ | LEM1843-05: pH = 2.70 < 4.3; | See Table 1.2 NP |
| | | LEM1843-48: pH = 2.65 < 4.3; | NP |
| | | LEM1843-27: pH = 2.73 < 4.3; | NP |
| | | LEM1918-12: pH = 2.80 < 4.3; | See Table 2.2 NP |
| | | LEM1918-46: pH = 2.77 < 4.3; | NP |
| | | LEM1918-29: pH = 2.83 < 4.3; | NP |

| Article from ND | Requirement according to IEC 60754-2:2011+AMD 1:2019 | Results | | Requirement fulfilling |
|---|---|---|---|---|
| Insulation pH value: pH ≥ 4,3 | | LEM1843-05: pH = 2.82 < 4.3; | See Table 1.2 | NP |
| | | LEM1843-48: pH = 2.78 < 4.3; | | NP |
| | | LEM1843-27: pH = 2.85 < 4.3; | | NP |
| | | LEM1918-12: pH = 2.79 < 4.3; | See Table 2.2 | NP |
| | | LEM1918-46: pH = 2.75 < 4.3; | | NP |
| | | LEM1918-29: pH = 2.83 < 4.3; | | NP |
| Filler pH value: pH ≥ 4,3 | | LEM1843-05: no filler | ---------- | NA |
| | | LEM1843-48: no filler | | NA |
| | | LEM1843-27: no filler | | NA |
| | | LEM1918-12: pH = 2.96 < 4.3; | See Table 2.2 | NP |
| | | LEM1918-46: pH = 2.92 < 4.3; | | NP |
| | | LEM1918-29: pH = 2.99 < 4.3; | | NP |
| Sheath conductivity value: $c \leq 10$ µS/mm | | LEM1843-05: *c =273.70 µS/mm >10 µS/mm* | See Table 1.2 | NP |
| | | LEM1843-48: *c =269.50 µS/mm >10 µS/mm* | | NP |
| | | LEM1843-27: *c =275.50 µS/mm >10 µS/mm* | | NP |
| | | LEM1918-12: *c* =177,80 *µS/mm >10 µS/mm* | See Table 2.2 | NP |
| | | LEM1918-46: *c* =174,50 *µS/mm >10 µS/mm* | | NP |
| | | LEM1918-29: *c* =180,20 *µS/mm >10 µS/mm* | | NP |
| Insulation conductivity value: c ≤10 µS/mm | | LEM1843-05: *c =175.00 µS/mm >10 µS/mm* | See Table 1.2 | NP |
| | | LEM1843-48: *c =172.40 µS/mm >10 µS/mm* | | NP |
| | | LEM1843-27: *c =178.30 µS/mm >10 µS/mm* | | NP |
| | | LEM1918-12: *c* =356,60 *µS/mm >10 µS/mm* | See Table 2.2 | NP |
| | | LEM1918-46: *c* =351,20 *µS/mm >10 µS/mm* | | NP |
| | | LEM1918-29: *c* =359,70 *µS/mm >10 µS/mm* | | NP |
| Filler conductivity value: c ≤10 µS/mm | | LEM1843-05: no filler | ---------- | NA |
| | | LEM1843-48: no filler | | NA |
| | | LEM1843-27: no filler | | NA |
| | | LEM1918-12: *c* =62,10 *µS/mm >10 µS/mm* | See Table 2.2 | NP |
| | | LEM1918-46: *c* =61,60 *µS/mm >10 µS/mm* | | NP |
| | | LEM1918-29: *c* =62,50 *µS/mm >10 µS/mm* | | NP |

Requirement fulfilling: P – Requirement is meet, NP – the requirement is not met, NA – The requirement does not apply

**Measurement uncertainties**

| Test Name (RI Point) | Measured/ calculated | Measuring Apparatus / Type / Series or Inventory | Calibration Certificate / Issuer | Extended uncertainty [U] | Expansion factor [k] |
|---|---|---|---|---|---|
| Determination of acidity (by measuring pH) and conductivity of gases released during combustion of materials taken from cables | Mass | Weighing machine with non-automatic operation / XT 220A / W 49027 | 23712-11.22 / METROMAT (LE 008) | 0,0002 g | 2 |
| | Temperature conditioning | Climate Chamber / Atlas SC600MH / 58566104960010 | 24202-11.22 / METROMAT (LE 008) | 0,5 °C | 2 |
| | Relative humidity conditioning | | | 3,0 % | 2 |
| | temperature | Thermostatic enclosure / calcination furnace / 001/2015 with indicator BTC-9100 Serial no 130025, serie 130027 | 24204-11.22 / METROMAT (LE 008) | 5,0 °C | 2 |
| | time | Digital Stopwatch / DELTA E 200 / M200473 | 001092-01.24 / METROMAT (LE 008) | 5,5 s | 2 |
| | pH | pH-meter / AL 15 / 89936 | 04-00215-01.2024 / METRON SERV (LE 015) | 0,05 | 2 |
| | conductivity | Conductometer / HI8424 / 87461 | 01-0967-04.2024 / METRON SERV (LE 015) | 2,5 % | 2 |

Note: The assigned uncertainty is the extended uncertainty obtained by multiplying the standard uncertainty by the expansion factor k = 2 and has been estimated in accordance with SR ISO/IEC Guide 98-3:2010. The value of the measurand is within the designated range of values with a probability of 95.45%.

**Table 1.1 – Test results of LEM-1844**

| Cable Code | LEM-1844-05 | LEM -1844-46 | LEM-1844-27 |
|---|---|---|---|
| **weighted pH'** | 2.72 | 2.67 | 2.75 |
| **weighted c' (uS/mm)** | 255.84 | 252.08 | 258.12 |

| mean | std. dev | Var.coef. [%] |
|---|---|---|
| **2.71** | 0.040 | 0.010 |
| **255.35** | 3.050 | 0.010 |

**Table 1.2 - Raw data of LEM-1844**

| sheath | LEM-1844-05 | LEM -1844-46 | LEM-1844-27 | mean | std. dev | var.coef. [%] |
|---|---|---|---|---|---|---|
| w [g/m] | 82.268 | 85.376 | 86.041 | 84.562 | 2.014 | 2.382 |
| pH | 2.70 | 2.65 | 2.73 | 2.69 | 0.040 | 1.501 |
| c [us/mm] | 273.700 | 269.500 | 275.500 | 272.900 | 3.079 | 1.128 |
| **insulation** | **LEM-1844-05** | **LEM -1844-46** | **LEM-1844-27** | **mean** | **std. dev** | **var.coef. [%]** |
| w [g/m] | 18.179 | 18.666 | 18.733 | 18.526 | 0.302 | 1.632 |
| pH | 2.82 | 2.78 | 2.85 | 2.82 | 0.035 | 1.247 |
| c [us/mm] | 175.000 | 172.400 | 178.300 | 175.233 | 2.957 | 1.687 |

**Table 2.1– Test results of LEM-1918**

| Cable Code | LEM-1918 -12 | LEM -1918 -26 | LEM-1918-49 |
|---|---|---|---|
| **weighted pH'** | 2,87 | 2,84 | 2,91 |
| **weighted c' (uS/mm)** | 144,85 | 143,30 | 146,41 |

| mean | std. dev | var.coef. [%] |
|---|---|---|
| **2,87** | 0,030 | 0,01 |
| **144,85** | 1,550 | 0,01 |

**Table 2.2- Raw data of LEM-1918**

| **sheath** | LEM-1918 -12 | LEM -1918 -26 | LEM-1918-49 | mean | std. dev | var.coef. [%] |
|---|---|---|---|---|---|---|
| w [g] | 28,151 | 28,373 | 29,082 | 28,535 | 0,486 | 1,704 |
| pH | 2,80 | 2,77 | 2,83 | 2,80 | 0,03 | 1,071 |
| c [us/cm] | 177,80 | 174,50 | 180,20 | 177,500 | 2,862 | 1,612 |
| **insulation** | **LEM-1918 -12** | **LEM -1918 -26** | **LEM-1918-49** | **mean** | **std. dev** | **var.coef. [%]** |
| w [g] | 13,015 | 13,12 | 13,173 | 13,103 | 0,08 | 0,614 |
| pH | 2,79 | 2,75 | 2,83 | 2,79 | 0,04 | 1,434 |
| c [us/cm] | 356,60 | 351,20 | 359,70 | 355,833 | 4,302 | 1,209 |
| **filler** | **LEM-1918 -12** | **LEM -1918 -26** | **LEM-1918-49** | **mean** | **std. dev** | **var.coef. [%]** |
| w [g] | 44,516 | 44,217 | 45,198 | 44,644 | 0,503 | 1,126 |
| pH | 2,96 | 2,92 | 2,99 | 2,96 | 0,035 | 1,188 |
| c [us/cm] | 62,10 | 61,60 | 62,50 | 62,067 | 0,451 | 0,727 |

*) The coefficients of variation did not exceed the limit of 5%.

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