

REPORT No 11945

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IEC 60754-1

DETERMINATION OF THE HALOGEN ACID GAS CONTENT

Program: SQO-PL6 (Round 11)

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Prepared by:	Reviewed by:	Approved by:
Mateo Giovanni Assistant Technician	Eng. Erika Brest Chemistry expert	Eng. Emiliano Medina Quality Assurance Lead

TABLE OF CONTENTS

1. FOREWORD	3
2. ORGANIZATION	3
3. OBJECTIVE	3
4. PARTICIPANTS	4
5. HOMOGENEITY	5
6. SAMPLE INFORMATION	5
7. IMAGES	6
8. ASSIGNED VALUES	6
9. PARTICIPANTS' RESULTS	7
10. STATISTICS	8
11. EVALUATION OF PERFORMANCE	9
12. CONCLUSIONS	12
 APPENDIX A	
 A1 - PARTICIPANT DATA	 13
 A2 - PARTICIPANT RESULTS	 13
 APPENDIX B	
 FINDINGS	 19

1. FOREWORD

This report summarizes the results of the **SQO-PL6 (Round 11)** proficiency testing program on the determination of amount of halogen acid gas emitted by burning cables. This program is carried out under a simultaneous participation format, as described in clause A.2.2 of ISO/IEC 17043: 2023 (Types of PT schemes).

South Quality conducted the testing program in June 2026. 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
Statistics:	Lic. Manuel Tozaki
Supervision:	Eng. Emiliano Medina

3. OBJECTIVE

The objective of this proficiency testing program is to determine the halogen acid gas content of cable materials.

This parameter is verified using the following standard:

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

For the verification of this, cable samples have been selected.

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

4. PARTICIPANTS

In the present round, 19 laboratories have participated with the following details:

CODE	Country	ISO 17025 Accredited	Results delivered
01	Belgium	Yes	Yes
02	Mexico	Yes	No
03	South Africa	Yes	Yes
04	Hong Kong	No	Yes
05	Spain	Yes	Yes
06	France	Yes	Yes
07	Peru	Yes	Yes
08	Chile	Yes	Yes
09	Germany	Yes	Yes
10	South Africa	No	No
11	England	Yes	Yes
12	Türkiye	Yes	Yes
13	Spain	Yes	Yes
14	Pakistan	No	Yes
15	Portugal	Yes	Yes
16	Italy	Yes	Yes
17	Canada	Yes	Yes
18	Argentina	No	No
19	Brazil	Yes	Yes

5. HOMOGENEITY

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

Then, a homogeneity study was then carried out 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 the samples were selected using random-number-generation software.

The results of this test appear below:

Size of each batch: **50 samples**

Tested samples from each batch: **15 samples**

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LEM2417	BATCH: LEM2418	BATCH: LEM2419
C_m	YES	YES	YES

Size of each batch: **50 samples**

Tested samples from each batch: **15 samples**

DETERMINATION	HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LEM3224	BATCH: LEM3225	BATCH: LEM3226
C_m	NO	YES	YES

Samples for this program are taken from selected batches identified as **LEM2418**, and **LEM3226**.

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.

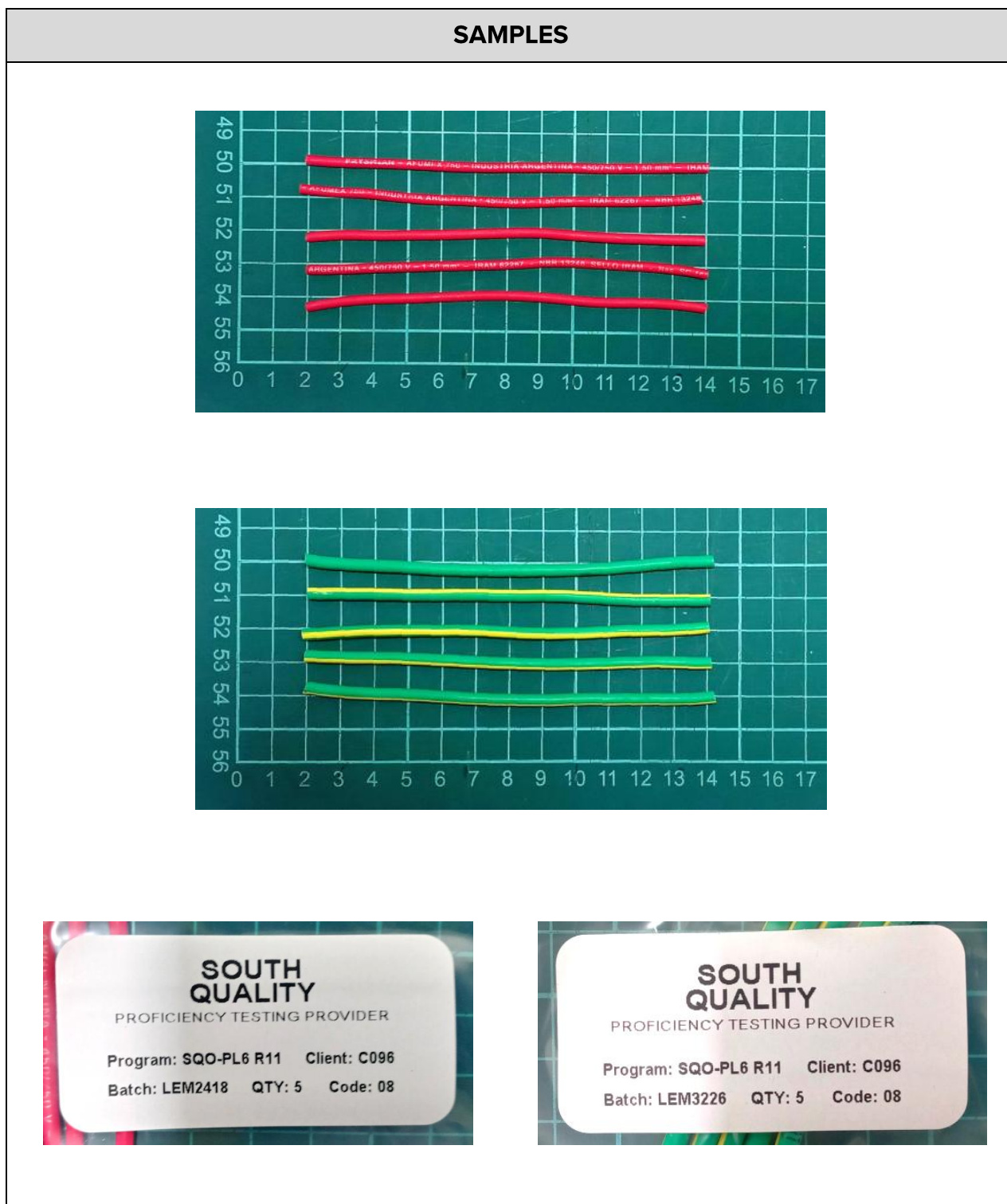
6. SAMPLE INFORMATION

The following samples were sent for testing (Participant **Code 12**):

Batch:	LEM2418
Sample ID:	08
Characteristics:	Red LSOH single core cable - 1.5 mm ² - Length: 12 cm - 5 units

Batch:	LEM3226
Sample ID:	08
Characteristics:	Green/Yellow LSOH single core cable - 2.5 mm ² - Length: 12 cm - 5 units

7. IMAGES



8. ASSIGNED VALUES

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

9. PARTICIPANTS' RESULTS

LABORATORY CODE	HALOGEN ACID GAS CONTENT - MEAN (%)	
	BATCH: LEM2418	BATCH: LEM3226
01	0.688	0.309
03	0.524	0.133
04	0.465	0.171
05	0.657	0.342
06	0.457	0.331
07	0.426	0.487
08	0.240	39.600
09	0.580	0.274
11	0.709	0.208
12	0.667	0.237
13	0.742	0.418
14	0.605	0.996
15	1.225	0.528
16	0.653	0.177
17	0.567	0.210
19	0.205	0.541

ASSIGNED VALUES - HALOGEN ACID GAS CONTENT			
LEM2418		LEM3226	
AVG	SD	AVG	SD
0.593	0.190	0.320	0.200

10. STATISTICS

The results must be treated as quantitative.

According to B.3.1.3 of ISO 17043 the appropriate technique is to compare participant results with the assigned values. The results can be compared using **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

LABORATORY CODE	z score	
	BATCH: LEM2418	BATCH: LEM3226
01	0.50	0.06
03	0.36	0.94
04	0.67	0.75
05	0.34	0.11
06	0.71	0.06
07	0.88	0.84
08	1.86	196.40
09	0.07	0.23
11	0.61	0.56
12	0.39	0.42
13	0.79	0.49
14	0.07	3.38
15	3.33	1.04
16	0.32	0.72
17	0.13	0.55
19	2.04	1.11

Laboratory Code 01: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 02: The laboratory has not sent the results before the deadline.

Laboratory Code 03: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 04: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 05: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 06: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 07: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 08: The laboratory has obtained an **UNSATISFACTORY** result with the **LEM3226** batch. Additionally, the laboratory has obtained a **SATISFACTORY** result with the **LEM2418** batch.

Laboratory Code 09: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 10: The laboratory has not sent the results before the deadline.

Laboratory Code 11: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 12: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 13: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 14: The laboratory has obtained an **UNSATISFACTORY** result with the **LEM3226** batch. Additionally, the laboratory has obtained a **SATISFACTORY** result with the **LEM2418** batch.

Laboratory Code 15: The laboratory has obtained an **UNSATISFACTORY** result with the **LEM2418** batch. Additionally, the laboratory has obtained a **SATISFACTORY** result with the **LEM3226** batch.

Laboratory Code 16: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 17: The laboratory obtained **SATISFACTORY** results for both samples.

Laboratory Code 18: The laboratory has not sent the results before the deadline.

Laboratory Code 19: The laboratory has obtained a **QUESTIONABLE** result with the **LEM2418** batch. Additionally, the laboratory has obtained a **SATISFACTORY** result with the **LEM3226** batch.

GLOBAL PERFORMANCE - SUM OF ABSOLUTE Z SCORE

POSITION	LABORATORY CODE	Z SCORE
1 st	09	0.30
2 nd	05	0.45
3 rd	01	0.56
4 th	17	0.68
5 th	06	0.77
6 th	12	0.81
7 th	16	1.04
8 th	11	1.17
9 th	13	1.28
10 th	03	1.30
11 th	04	1.42
12 th	07	1.72
13 th	19	3.15
14 th	14	3.45
15 th	15	4.37
16 th	08	198.26

12. CONCLUSIONS

The overall performance in the **SQO-PL6 (Round 11)** program, based on expected results from the participating laboratories, was as follows:

- Laboratories Codes **01, 03, 04, 05, 06, 07, 09, 11, 12, 13, 16,** and **17** have obtained a **SUFFICIENT** performance according to the expected results and should not take action;
- Laboratory Code **19** has obtained an **ALMOST SUFFICIENT** performance according to the expected results and must evaluate if it is necessary to take corrective action.
- Laboratories Codes **08, 14,** and **15** have obtained an **INSUFFICIENT** performance according to the expected results and must take corrective action (See Appendix B).

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

- **SUFFICIENT** performance: No unsatisfactory/questionable results 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 A

A1 - PARTICIPANT DATA

Company: **Lenor Chile Spa**

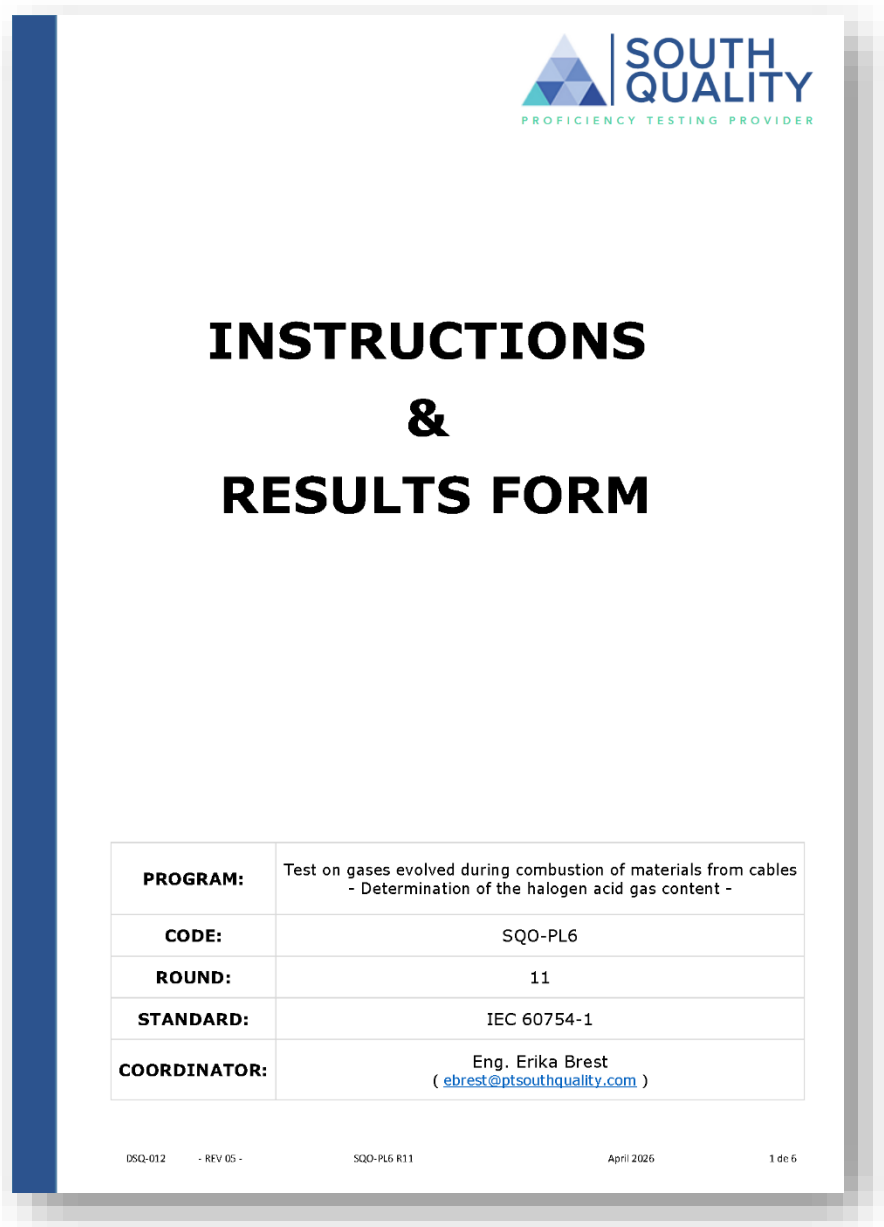
Laboratory: Lenor Chile Spa

Country: Chile

Client ID: C096

Contact person: Braulio Gutiérrez (Jefe de Metrología)
braulio.gutierrez@lenorgroup.com

A2 - PARTICIPANT RESULTS



PROGRAM:	Test on gases evolved during combustion of materials from cables - Determination of the halogen acid gas content -
CODE:	SQO-PL6
ROUND:	11
STANDARD:	IEC 60754-1
COORDINATOR:	Eng. Erika Brest (ebrest@ptsouthquality.com)

DSQ-012 - REV 05 - SQO-PL6 R11 April 2026 1 de 6

1 - General

This document is intended to be filled with the results of the **SQO-PL6 (Round 11)** program.

Results must be typed, not handwritten.

2 - Standard

IEC 60754-1: 2011 + AMD 1: 2019

3 - Participant

LENOR CHILE SPA	CODE 08
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4 - Tests involved

TEST
Determination of the amount of halogen acid gas evolved during the combustion of electric cable (C_m)

5 - Samples

CODE	SAMPLE	QUANTITY
LEM2418-08	Red single core cable - 1.5 mm ² Length: 12cm	5
LEM3226-08	Green/Yellow single core cable - 2.5 mm ² Length: 12cm	5

6 - Notes

- The deadline for the delivery of results is **June 12, 2026**.
- The tables in this document may be modified by the participant, if desired, to include data or observations.
- The participant shall cut the five samples received and mix them thoroughly. Subsequently, two 750 mg test portions shall be prepared in accordance with the instructions specified in Clause 6.1 of the standard.
- 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.
- Upon completion of this document, please convert it to a PDF file and send it to the program coordinator.

7 - Test results

Date:	12-06-2026
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CONDITIONING	
Temperature (°C):	23,2
Relative humidity (%):	51
Time (h):	16

Reagent:	solución de tiocianato de amonio
Type of test apparatus (Method):	Equipo de ensayo metodo 1

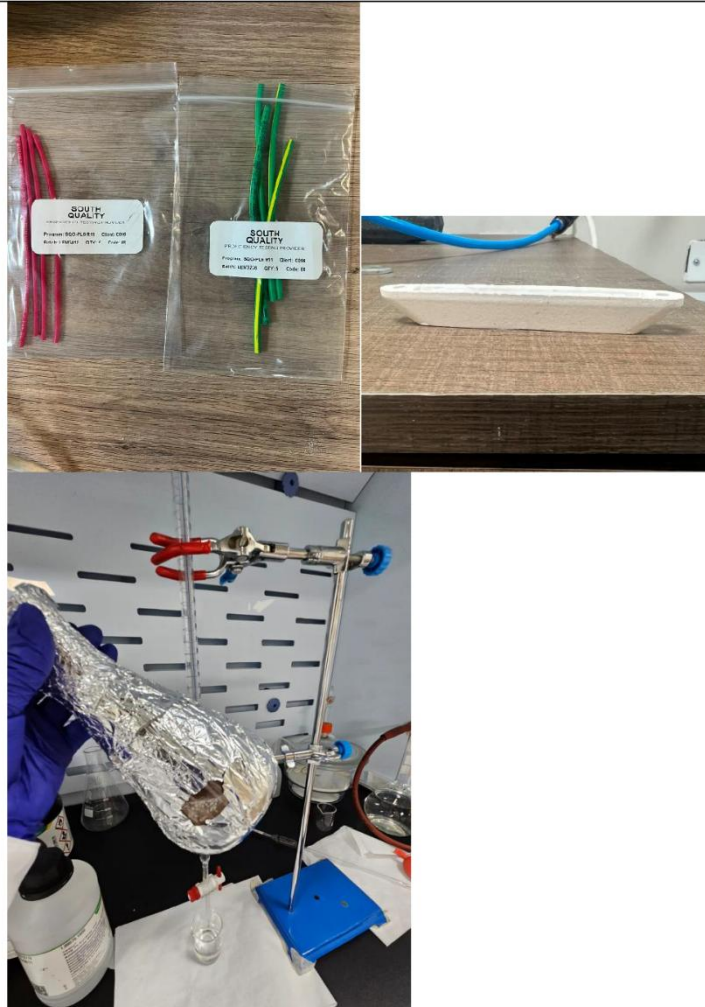
LEM2418-08	
SAMPLE	Halogen acid gas content (%)
I	0,24
II	0,24
MEAN	0,24

LEM3226-08	
SAMPLE	Amount of halogen containing gas (%)
I	39,6
II	39,6
MEAN	39,6

Cálculo del contenido de ácido halógeno		P
LEM2418-08 (cable rojo)		Veredicto
Formula	$C = \frac{(36,5 (B-A) M \frac{1000}{200})}{m}$	
A	Volumen en ml de solución de tiocianato de amonio 0,1 M utilizada en la determinación de la muestra de ensayo;	
B	Volumen en ml de solución de tiocianato de amonio 0,1 M utilizada en la determinación del ensayo en blanco;	
C	Es la cantidad de ácido halógeno expresada en miligramos de ácido clorhídrico por gramo de muestra de ensayo	
m	La masa de la muestra de ensayo tomada en gramos	
M	La molaridad de la solución de tiocianato de amonio	
36,5	La masa molar del cloruro de hidrógeno	
Resultado valoración muestra en blanco		
19,8 mL		
Resultados valoración de muestras de ensayos		
Muestra 1	Muestra 2	Variaciones individuales con respecto a la media ±10%
19,7 mL	19,7 mL	0%
Cálculo del contenido de ácido halógeno		
Muestra 1	Muestra 2	Variaciones individuales con respecto a la media ±10%
$C = \frac{(36,5 (19,8 - 19,7) 0,1 \frac{1000}{200})}{0,7536}$ C= 2,42 mg/g	$C = \frac{(36,5 (19,8 - 19,7) 0,1 \frac{1000}{200})}{0,7502}$ C= 2,43 mg/g	-
0,24%	0,24%	0%
Observaciones: * Registrar C = 5 cuando la cantidad de ácido halógeno sea inferior a 5 mg/g.		
Evaluación de emisión de gases ácidos		
Resultado	Requisito	Veredicto
0,24%	0,50%	P

Cálculo del contenido de ácido halógeno		F
LEM3226-08 (cable verde)		Veredicto
Formula	$C = \frac{(36,5 (B-A) M \frac{1000}{200})}{m}$	
A	Volumen en ml de solución de tiocianato de amonio 0,1 M utilizada en la determinación de la muestra de ensayo;	
B	Volumen en ml de solución de tiocianato de amonio 0,1 M utilizada en la determinación del ensayo en blanco;	
C	Es la cantidad de ácido halógeno expresada en miligramos de ácido clorhídrico por gramo de muestra de ensayo	
m	La masa de la muestra de ensayo tomada en gramos	
M	La molaridad de la solución de tiocianato de amonio	
36,5	La masa molar del cloruro de hidrógeno	
Resultado valoración muestra en blanco		
19,8 mL		
Resultados valoración de muestras de ensayos		
Muestra 1	Muestra 2	Variaciones individuales con respecto a la media ±10%
3,5 mL	3,5 mL	0%
Cálculo del contenido de ácido halógeno		
Muestra 1	Muestra 2	Variaciones individuales con respecto a la media ±10%
$C = \frac{(36,5 (19,8 - 3,5) 0,1 \frac{1000}{200})}{0,7506}$ C= 396,32 mg/g	$C = \frac{(36,5 (19,8 - 3,5) 0,1 \frac{1000}{200})}{0,7508}$ C= 396,24 mg/g	-
39,6%	39,6%	0%
Evaluación de emisión de gases ácidos		
Resultado	Requisito	Veredicto
39,6%	0,50%	F

Fotos



DSQ-012 - REV 05 -

SQO-PL6 R11

April 2026

6 de 6

APPENDIX B

FINDINGS

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

Any identified differences in the application of the test method may be documented in this report.

Where unsatisfactory or discrepant results are identified, participating laboratories are expected to address the relevant areas for improvement to ensure compliance with the applicable standard (IEC 60754-1) and to maintain the reliability of future results.

Laboratories are therefore requested to implement appropriate corrective actions to enhance their performance in subsequent rounds.

The following differences were observed for participant **code 08**:

Clause	Laboratory CODE 08	Most participants (*)
5.6	Method 1	Method 2

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

The findings described above refer exclusively to observed differences among the results submitted by participants. They do not imply, in any way, that the participant's result is directly attributable to these differences.

The participant is expected to conduct an internal analysis of any deviations that may have occurred during testing and to take appropriate corrective measures.

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