SOUTH QUALITY

PROFICIENCY TESTING PROVIDER

REPORT No 12051

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****

IEC 60529

DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODE)

Program: SQO-IP1 (Round 9)

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1. FOREWORD

This report summarizes the results of the **SQO-IP1 (Round 9)** proficiency testing program on the classification of degrees of protection of enclosures. 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 between July and September 2026. The aim of the program was to assess the ability of laboratories to competently perform the nominated tests.

2. ORGANIZATION

Program Coordinator:	Eng. Esteban Di Marco
Assistant Technician:	Valentyn Kravchenko
Statistics:	Lic. Manuel Tozaki
Supervision:	Eng. Emiliano Medina

3. OBJECTIVE

The objective of this proficiency testing program is to determine the minimum approved IP code protection level for the samples provided, in accordance with the following standard:

Standard
IEC 60529 Ed. 2.2

To perform this verification, batches of luminaires and industrial enclosures were selected.

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

4. PARTICIPANTS

In the present round, 24 laboratories have participated with the following details:

CODE	Country	ISO 17025 accredited	Results delivered
01	Hong Kong	Yes	Yes
02	Romania	Yes	Yes
03	Pakistan	No	No
04	China	Yes	Yes
05	Malaysia	Yes	Yes
06	France	Yes	Yes
07	Colombia	No	Yes
08	Spain	Yes	No
09	Spain	Yes	Yes
10	Brazil	Yes	Yes
11	Brazil	Yes	Yes
12	Portugal	Yes	Yes
13	Argentina	No	Yes
14	Peru	Yes	Yes
15	England	Yes	No
16	South Korea	Yes	Yes
17	Chile	Yes	Yes
18	Germany	Yes	Yes
19	Thailand	Yes	Yes
20	Mexico	Yes	Yes
21	Italy	Yes	Yes
22	Netherlands	Yes	Yes
23	Netherlands	Yes	Yes
24	Belgium	Yes	No

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 the 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: **10 units**

DETERMINATION	LUMINAIRE - HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LIP3527	BATCH: LIP3528	BATCH: LIP3529
IP code	YES	YES	YES

Size of each batch: **50 units** Tested samples from each batch: **10 units**

DETERMINATION	INDUSTRIAL ENCLOSURE - HOMOGENEITY OF RESULTS IN THE ANALYZED SAMPLES		
	BATCH: LIP4238	BATCH: LIP4239	BATCH: LIP4240
IP code	YES	NO	YES

Samples for this program are taken from the selected batches identified as **LIP3528**, and **LIP4240**.

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.

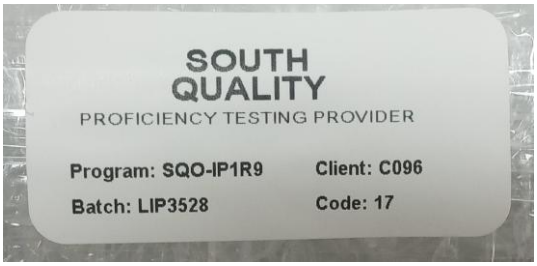
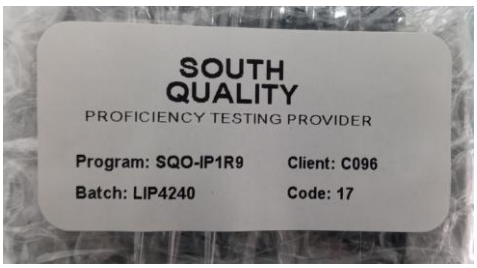
6. SAMPLE INFORMATION

The following samples were sent for testing (Participant **Code 17**):

Batch:	LIP3528
Sample ID:	17
Characteristics:	Garden lamp stand - No lamp

Batch:	LIP4240
Sample ID:	17
Characteristics:	Industrial enclosure - 8.0 x 7.5 x 6.5 cm

7. IMAGES

SAMPLES
  
GARDEN LAMP STAND
  
INDUSTRIAL ENCLOSURE

8. ASSIGNED RESULTS

The assigned results are derived from the consensus of the valid results reported by participating laboratories (**Consensus values**).

Results submitted after the deadline, missing results, and results excluded under the statistical procedure are not included in the consensus.

9. STATISTICS

The results must be treated as quantitative.

For quantitative results the comparison is made according to B.4.1.3 of ISO 17043 and the appropriate technique is to compare participant results with the assigned values. The results can be compared using difference $\boldsymbol{D}$**.**

$$D = (x - X)$$

x is the participant's result

X is the assigned value

The performance evaluation is carried out with the following criteria:

$|D| = 0$ indicates "satisfactory" performance and generates no signal;

$|D| = 1$ indicates "questionable" performance and generates a warning signal;

$|D| > 1$ indicates "unsatisfactory" performance and generates an action signal;

10. PARTICIPANTS' RESULTS

LABORATORY CODE	IP CODE			
	Batch: LIP3528		Batch: LIP4240	
	First characteristic numeral	Second characteristic numeral	First characteristic numeral	Second characteristic numeral
01	5	3	5	4
02	5	3	5	5
04	5	3	5	4
05	NP	3	NP	4
07	5	3	5	4
09	5	2	5	4
10	5	3	5	4
11	5	3	5	4
12	3	3	5	6
13	5	3	5	4
14	5	3	6	4
16	5	3	5	4
17	5	ND	NP	NP
18	5	3	5	2
19	NP	6	NP	4
20	5	3	5	4
21	3	5	6	6
22	2	3	5	4
23	5	3	6	4

ASSIGNED VALUES				
PROPERTY	**Batch: LIP3528**		**Batch: LIP4240**	
IP CODE	**5**	**3**	**5**	**4**

Legends: **ND**: Not determined

NP: Not performed

11. EVALUATION OF PERFORMANCE

LABORATORY CODE	$\|D\|$			
	Batch: LIP3528		Batch: LIP4240	
	First characteristic numeral	Second characteristic numeral	First characteristic numeral	Second characteristic numeral
01	0	0	0	0
02	0	0	0	1
04	0	0	0	0
05	-	0	-	0
07	0	0	0	0
09	0	1	0	0
10	0	0	0	0
11	0	0	0	0
12	2	0	0	2
13	0	0	0	0
14	0	0	1	0
16	0	0	0	0
17	0	-	-	-
18	0	0	0	2
19	-	3	-	0
20	0	0	0	0
21	2	2	1	2
22	3	0	0	0
23	0	0	1	0

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

Laboratory **Code 02**: The laboratory obtained a **QUESTIONABLE** result in the verification of the second characteristic numeral for batch **LIP4240**. However, it achieved **SATISFACTORY** results in the verification of the remaining parameters.

Laboratory **Code 03**: The laboratory did not send the results before the deadline.

Laboratory **Code 04**: The laboratory obtained **SATISFACTORY** results in the verification of all parameters.

Laboratory **Code 05**: The laboratory did not perform the determination of the first characteristic numeral for either batch, as it does not carry out dust testing. It obtained **SATISFACTORY** results in the verification of the second characteristic numeral for both batches.

Laboratory **Code 06**: The laboratory did not send the results before the deadline.

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

Laboratory **Code 08**: The laboratory did not send the results before the deadline.

Laboratory **Code 09**: The laboratory obtained a **QUESTIONABLE** result in the verification of the second characteristic numeral for batch **LIP3528**. However, it achieved **SATISFACTORY** results in the verification of the remaining parameters.

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

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

Laboratory **Code 12**: The laboratory obtained **UNSATISFACTORY** results in the verification of the first characteristic numeral for batch **LIP3528** and of the second characteristic numeral for batch **LIP4240**. However, it achieved **SATISFACTORY** results in the verification of the remaining parameters.

Laboratory **Code 13**: The laboratory obtained **SATISFACTORY** results in the verification of all parameters.

Laboratory **Code 14**: The laboratory obtained a **QUESTIONABLE** result in the verification of the first characteristic numeral for batch **LIP4240**. However, it achieved **SATISFACTORY** results in the verification of the remaining parameters.

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

Laboratory **Code 16**: The laboratory obtained **SATISFACTORY** results in the verification of all parameters.

Laboratory **Code 17**: The laboratory obtained a **SATISFACTORY** result in the verification of the first characteristic numeral for batch **LIP3528**. For the second characteristic numeral of batch **LIP3528**, it did not determine compliance: it only indicated the degree that was not met, without stating the degree that was met. It did not submit the results for batch **LIP4240** before the deadline.

Laboratory **Code 18**: The laboratory obtained an **UNSATISFACTORY** result in the verification of the second characteristic numeral for batch **LIP4240**. However, it achieved **SATISFACTORY** results in the verification of the remaining parameters.

Laboratory **Code 19**: The laboratory did not perform the determination of the first characteristic numeral for either batch, because its dust testing equipment failed. It obtained an **UNSATISFACTORY** result in the verification of the second characteristic numeral for batch **LIP3528** and a **SATISFACTORY** result for batch **LIP4240**.

Laboratory **Code 20**: The laboratory obtained **SATISFACTORY** results in the verification of all parameters.

Laboratory **Code 21**: The laboratory obtained **UNSATISFACTORY** results in the verification of both characteristic numerals for batch **LIP3528** and of the second characteristic numeral for batch **LIP4240**. It obtained a **QUESTIONABLE** result in the verification of the first characteristic numeral for batch **LIP4240**.

Laboratory **Code 22**: The laboratory obtained an **UNSATISFACTORY** result in the verification of the first characteristic numeral for batch **LIP3528**. However, it achieved **SATISFACTORY** results in the verification of the remaining parameters.

Laboratory **Code 23**: The laboratory obtained a **QUESTIONABLE** result in the verification of the first characteristic numeral for batch **LIP4240**. However, it achieved **SATISFACTORY** results in the verification of the remaining parameters.

Laboratory **Code 24**: The laboratory did not send the results before the deadline.

12. CONCLUSIONS

The overall performance of the laboratories participating in the **SQO-IP1 (Round 9)** program, based on expected results from the participating laboratories, was as follows:

- Participants Codes **01, 04, 05, 07, 10, 11, 13, 16, 17,** and **20** have obtained a **SUFFICIENT** performance according to the expected results and should not take action.

- Participants Codes **02, 09, 14,** and **23** have obtained an **ALMOST SUFFICIENT** performance according to the expected results and must evaluate if it is necessary to take corrective action.

- Participants Codes **12, 18, 19, 21,** and **22** have obtained an **INSUFFICIENT** performance in accordance with the expected results and must take corrective action (See annex 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**

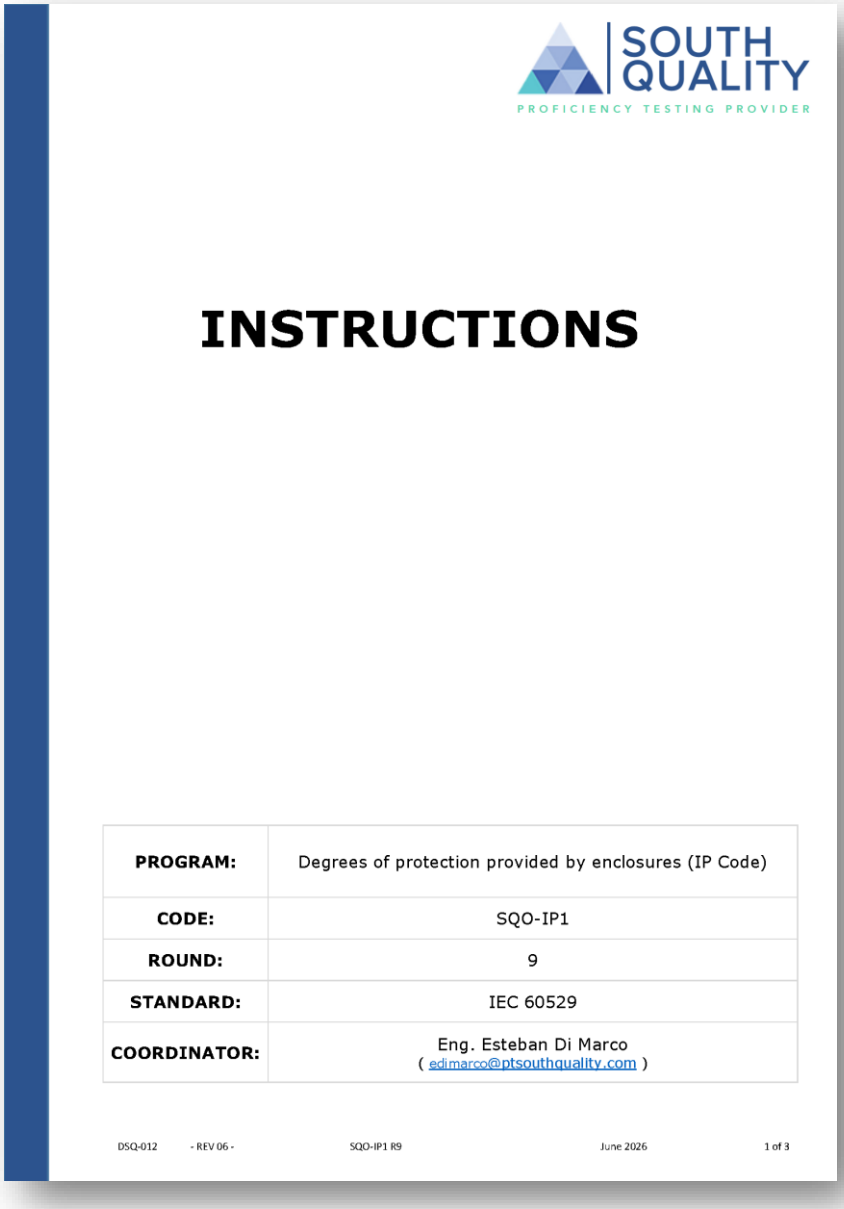
Country: Chile

Client ID: C096

Contact person: Braulio Gutiérrez - Jefe de Metrología

braulio.gutierrez@lenorgroup.com

A2 - INSTRUCTIONS



INSTRUCTIONS

PROGRAM:	Degrees of protection provided by enclosures (IP Code)
CODE:	SQO-IP1
ROUND:	9
STANDARD:	IEC 60529
COORDINATOR:	Eng. Esteban Di Marco (edimarco@ptsouthquality.com)

DSQ-012 - REV 06 - SQO-IP1 R9 June 2026 1 of 3

1 - General

This document serves as a guide for managing the results of the **SQO-IP1 (Round 9)** program.

2 - Standard

IEC 60529 Ed. 2.2

3 - Participant

LENOR CHILE	**CODE 17**

4 - Tests involved

TEST
Classification - Minimum approved degree of protection (First and second characteristic number)

5 - Samples

CODE	SAMPLE	QUANTITY
LIP3528-17	Garden lamp stand - No lamp	1
LIP4240-17	Industrial enclosure - 8.0 x 7.5 x 6.5 cm	1

6 - Notes

a) The deadline for the delivery of results is **August 21, 2026**.
b) The participant must submit the results using the usual report employed by their laboratory.
c) The maximum IP ratings to be verified (inclusive) are as follows:

LIP3528	IP 56
LIP4240	IP 66

d) The samples are to be handled as routine lab samples, with all testing, documentation, and reporting adhering to **IEC 60529**.
e) To review the results, test images would be appreciated. Images can be attached at the end of this document or sent by email.

PHOTOGRAPHS

A3 - PARTICIPANT RESULTS (TEST REPORT)

LENOR

Informe Nº SQO-IP1

INFORME DE ENSAYO VOLUNTARIO
GRADOS DE PROTECCIÓN PROPORCIONADOS POR ENVOLTURAS (CÓDIGO IP)

Informe de Ensayo N.º	:	**SQO-IP1**
Realizado por (+ firma)	:	Laboratorista Bastian Soto Q.
Aprobado por (+ firma)	:	Responsable tecnico del laboratorio Jorge Carcamo C.
Fecha de emisión	:	**21/08/2026**
Cliente	:	---
Dirección	:	---
Laboratorio de Ensayo	:	Lenor Chile SpA
Dirección	:	Av. Santa Rosa N°2898, San Joaquín, R. M., Chile
Lugar de Ensayo	:	Av. Santa Rosa N°2898, San Joaquín, R. M., Chile
Nombre del Solicitante	:	---
Dirección	:	---
Protocolo de Ensayo	:	---
Normas	:	IEC 60529 ed. 2.2
Método de prueba	:	---
TRF Original	:	Lenor Chile SpA
Denominación del producto	:	Luminaria fija
Producto	:	Lampara de jardín
Marca del Producto	:	Marca no indicada
Fabricante	:	---
Dirección	:	---
Modelo o Tipo de referencia	:	Modelo no indicado
Valores y características	:	Características no indicadas
Origen	:	Pais de origen no indicado

IEC 60529:2001 **LENOR CHILELABORATORIO** **R.03**
Página 1 de 10

Resumen de los Ensayos
Organismo de Certificación:
Contenidos: IEC60529
- **ANEXO I :** Ensayo primera cifra IP
- **ANEXO II:** Ensayo segundo cifra IP
- **ANEXO III :** Listado de instrumentos y dispositivos utilizados
- **ANEXO IV:** Fotos de las muestras

Posibles veredictos del caso de prueba	
En caso de que es test no aplica el ensayo	N/A (No aplica)
El objeto de la prueba reúne el requisito	P(Pasa)
El objeto de la prueba no reúne el requisito	F(Falla)
Pruebas.....	:
Fecha de recepción del artículo a ensayar	---
Fecha de realización de las pruebas	---
Comentarios generales	
- Los resultados presentados en este informe se basan únicamente en el objeto ensayado.	
- Este informe no debe ser reproducido salvo en forma completa con la aprobación escrita del Laboratorio de Ensayo Emisor.	
- A través de este informe, la coma es utilizada como un separador decimal.	

GRADOS DE PROTECCIÓN CONTRA OBJETOS SOLIDOS EXTERNOS INDICADOS POR EL PRIMER NÚMERO CARACTERÍSTICO	GRADOS DE PROTECCIÓN CONTRA EL AGUA INDICADOS POR EL SEGUNDO NÚMERO CARACTERÍSTICO

GRADOS DE PROTECCIÓN CONTRA OBJETOS SOLIDOS EXTERNOS INDICADOS POR EL PRIMER NÚMERO CARACTERÍSTICO

Primer número característico	Grado de protección		Condiciones de ensayo, vea	Comentario	Veredicto
	Breve descripción	Definición			
0	No-protegido	-	-		N/A
1	Protegido contra objetos solidos externos de 50 mm Ø y mayor	El calibre de acceso, esfera de 50 mm Ø, no penetrara completamente 1).	13.2		N/A
2	Protegido contra objetos solidos externos de 12,5 mm Ø y mayor con un dedo	El calibre de acceso, esfera de 12,5 mm Ø, no penetrara completamente 1) .	13.2	Se preacondicion a la muestra según lo indicado en 9.2.1 de la norma IEC 60598-1 Ver anexo I	P
3	Protegido contra objetos solidos externos de 2,5 mm Ø y mayor	El calibre de acceso, esfera de 2,5 mm Ø, no penetrara completamente 1).	13.2		N/A
4	Protegido contra objetos solidos externos de 1,0mm Ø y mayor	El calibre de acceso, esfera de 1,0mm Ø, no penetrara completamente 1).	13.2		N/A
5	Protegido del polvo	El ingreso de polvo no está totalmente prevenido pero el polvo no penetrara en una cantidad que interfiera con la operación satisfactoria del aparato o deteriore la seguridad .	13.4 13.5	Se preacondiciona la muestra según lo indicado en 9.2.1 de la norma IEC 60598-1 Ver anexo I	P
6	Hermético al polvo	No ingreso de polvo.	13.4 y 13.6		N/A

1) El diámetro total del calibre de ensayo no pasara a través de ninguna abertura de la envoltura.

GRADOS DE PROTECCIÓN CONTRA EL AGUA INDICADOS POR EL SEGUNDO NÚMERO CARACTERÍSTICO

Segundo número característico	Grado de protección		Condiciones de ensayo, vea		Veredicto
	Breve descripción	Definición			
0	No-protegido	-	-		P
1	Protegido contra gotas de agua verticalmente descendientes	Las caídas de gotas verticales no tendrán efectos perjudiciales	14.2.1		N/A
2	Protegido contra gotas de agua verticalmente descendientes cuando la envoltura esta inclinada hasta 15º.	Las caídas de gotas verticales no tendrán efectos perjudiciales cuando la envoltura es inclinada a cualquier ángulo hasta 15º de cualquier lado vertical	14.2.2		N/A
3	Protegido contra agua de rocío	El agua rociada a un ángulo hasta 60º de cualquier lado vertical, no tendrá efectos perjudiciales	14.2.3		N/A
4	Protegido contra salpicaduras de agua	El agua salpicada contra la envoltura desde cualquier dirección no tendrá efectos perjudiciales	14.2.4		N/A
5	Protegido contra chorros de agua	El agua proyectada en chorros contra la envoltura desde cualquier dirección no tendrá efectos perjudiciales	14.2.5		N/A
6	Protegido contra chorros de agua de gran alcance	El agua proyectada en chorros de gran alcance contra la envoltura desde cualquier dirección no tendrá efectos perjudiciales	14.2.6	Se preacondiciona la muestra según lo indicado en 9.2.7 de la norma IEC 60598-1 Ver anexo IV	P

7	Protegido contra los efectos de inmersión transitoria en agua	El ingreso de agua en cantidades que causen efectos perjudiciales no será posible cuando la envoltura este inmersa temporalmente en agua bajo condiciones normalizadas de presión y tiempo	14.2.7		N/A
8	Protegido contra los efectos de inmersión continua en agua	El ingreso de agua en cantidades que causen efectos perjudiciales no será posible cuando la envoltura este inmersa continuamente en agua bajo condiciones que se acordaran entre el fabricante y el usuario pero que sean más severas que para el numero 7	14.2.8		N/A

ANEXO I
ENSAYOS PRIMERA CIFRA IP

Primera cifra IP		
Numero de IP	13.6.2 Condiciones de aceptación para el primer número característico IP6X La protección es satisfactoria si no se observa depósito de polvo al interior de la envoltura al final del ensayo	Tiempo de ensayo
IP2X	P	
N° de muestra	Observaciones	
LIP3528-17	Durante el ensayo se verifico que la sonda no logra ingresar al interior del producto.	
Observaciones generales	---	

Primera cifra IP		
Numero de IP	13.6.2 Condiciones de aceptación para el primer número característico IP6X La protección es satisfactoria si no se observa depósito de polvo al interior de la envoltura al final del ensayo	Tiempo de ensayo
IP5X	P	3 Horas
N° de muestra	Observaciones	
LIP3528-17	Durante el ensayo logra ingresar polvo al interior de la muestra, se considera que el producto aprueba el ensayo ya que la cantidad de polvo que logra ingresar no es perjudicial para la seguridad del producto.	
Observaciones generales	Primera cifra característica IP5X: El ensayo es realizado usando una cámara de polvo. Las envolturas herméticas al polvo para el numero IP5X el ingreso no está totalmente prevenido **Previo al ensayo se preacondiciona la muestra según lo indicado en la norma del producto es decir según lo indicado en el punto normativo 9.2.1 de la norma IEC 60598-1**	

ANEXO II
ENSAYO SEGUNDA CIFRA IP

Segunda cifra IP			
Numero de IP	Se somete el producto dentro del estanque con agua y se le aplica presión de aire (0,13Mpa) durante 30 min	Temperatura del agua 15 °C ± 10 °C	Tiempo de ensayo
IPX6	P	16,2°C	3 minutos por muestra ensayada
N° de muestra	Observaciones		
LIP3528-17	Luego del ensayo se observa que ingreso una gran cantidad de agua al interior del producto		
Observaciones Generales	Segunda cifra característica IPX6: Las luminarias protegidas contra los potentes chorros de agua, se apagan e inmediatamente se someten durante un periodo de 3 min a un chorro de agua en todas las direcciones. **Previo al ensayo se preacondiciona la muestra según lo indicado en la norma del producto es decir según lo indicado en el punto normativo 9.2.7 de la norma IEC 60598-1**		

Rigidez dieléctrica				
Numero IP	Aislamiento de las partes (MBTS y otras que no sean MBTS)	Tipo de la Clase de luminaria	Tensión Aplicada	Resultado
IPX6	Otras que no son MBTS	CLASE II	2880V~	F
N° de muestra	Observación			
LIP3528-17	Durante el ensayo se producen rupturas en el aislamiento			
Observaciones:	Entre partes activas y la superficie del montaje La tensión se aplica gradualmente hasta llegar a los 2880V~ **Con el fin de verificar completamente si el producto falla o no se aplicó el ensayo de rigidez según lo indicado en el punto normativo 10.2.2 de la norma del producto IEC 60598-1**			

ANEXO III
LISTADO DE INSTRUMENTOS Y DISPOSITIVOS UTILIZADOS

Código Interno	Detalle
LE000725	cámara de polvo
LE000950	Boquilla IPX6
LE000973	Dedo de prueba articulado

ANEXO IV
FOTOS DE LAS MUESTRA









Fin de documento

APPENDIX B

VOID

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