SOUTH QUALITY

PROFICIENCY TESTING PROVIDER

REPORT No 12051

Date of issue: *October 7, 2026*

Status: FINAL REPORT

****

IEC 60529

DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODE)

Program: SQO-IP1 (Round 9)

****

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Prepared by:	Reviewed by:	Approved by:
cn=VALENTYN E. KRAVCHENKO, o=PT SOUTH QUALITY SAS, ou=SOUTH QUALITY, email=tech@ptsouthquality.com, c=AR 2026.10.07 16:57:51 -03'00'	cn=ESTEBAN DI MARCO, o=PT SOUTH QUALITY SAS, ou=SOUTH QUALITY, email=edimarco@ptsouthquality.com, c=AR 2026.10.08 09:37:17 -03'00'	cn=Emiliano Medina, o=SOUTH QUALITY, ou=PT SOUTH QUALITY SAS, email=quality@ptsouthquality.com, c=ES 2026.10.08 14:18:52 -03'00'
Valentyn Kravchenko Assistant Technician	**Eng. Esteban Di Marco** Electromechanical expert	**Eng. Emiliano Medina** Quality Assurance Lead

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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.

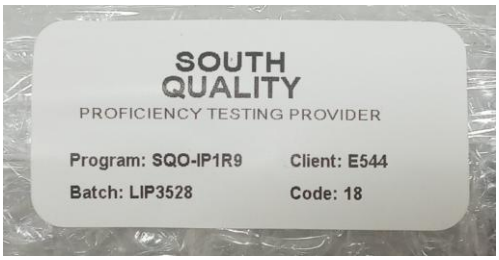
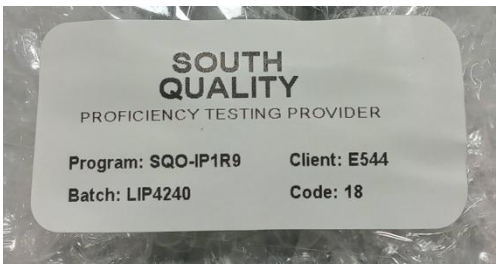
6. SAMPLE INFORMATION

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

Batch:	LIP3528
Sample ID:	18
Characteristics:	Garden lamp stand - No lamp

Batch:	LIP4240
Sample ID:	18
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 ***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.

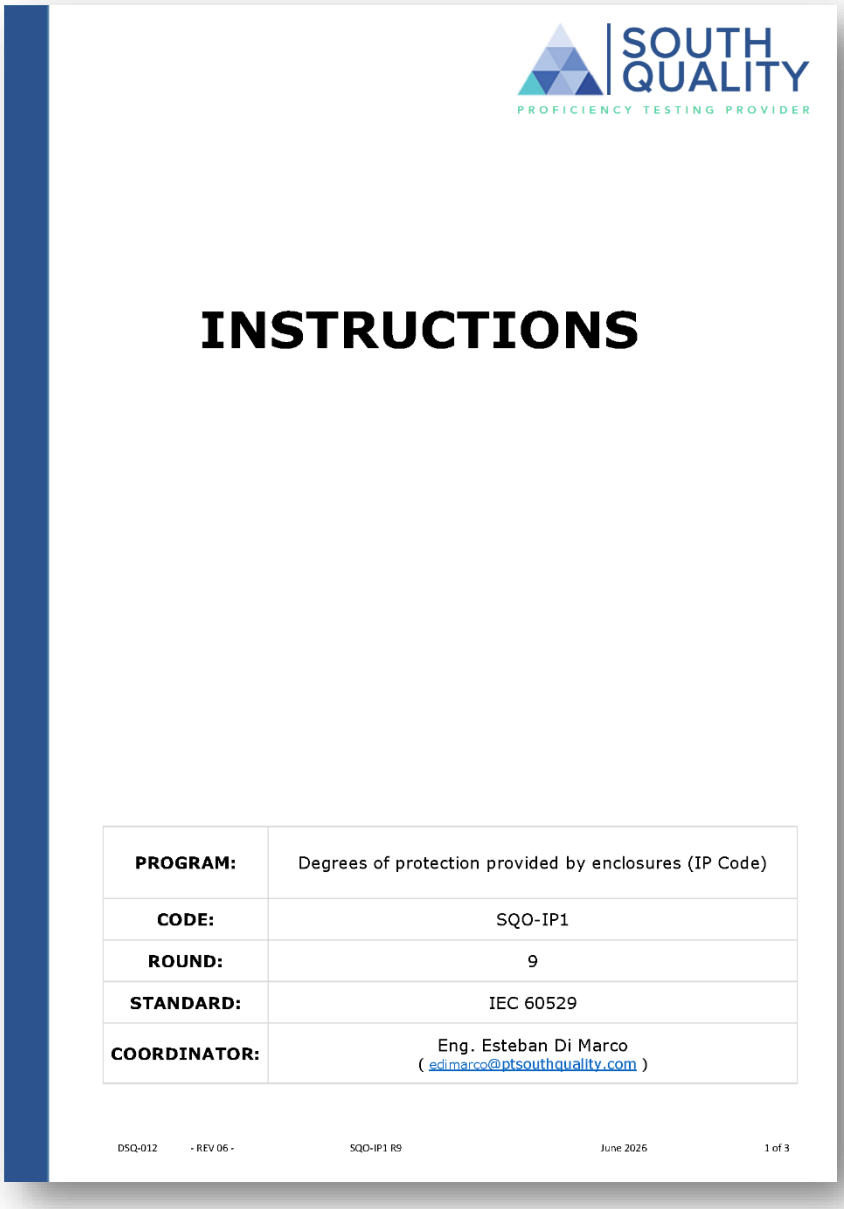
- **INSUFFICIENT** performance: An unsatisfactory result or two questionable results were obtained.

APPENDIX A

A1 - PARTICIPANT DATA

Company:	**SCHÜCO INTERNATIONAL KG**
Laboratory:	**OneLab Technology Center**
Country:	Germany
Client ID:	E544
Contact person:	Timo Amtsberg - Test Specialist
	tamtsberg@schueco.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

SCHÜCO INTERNATIONAL KG OneLab Technology Center	**CODE 18**

4 - Tests involved

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

5 - Samples

CODE	SAMPLE	QUANTITY
LIP3528-18	Garden lamp stand - No lamp	1
LIP4240-18	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 #P-26-0018-T01-J03-R03)

Technology Center

Test Report | **P-26-0018-T01-J03-R03**

Date of report:	21.08.2026
No. of pages in report:	10
Attachments:	-

OneLab
TECHNOLOGY CENTER

Client:	Technology Center Schüco International KG Karolinenstr. 1-15 33609 Bielefeld Germany
Test basis:	Degrees of protection test - second digit (protection against water) according to DIN EN 60529 Degrees of protection test - first digit (ingress of solid foreign objects/hazardous parts) according to DIN EN 60529

Accredited testing laboratory by DAkkS
in accordance with DIN EN ISO/IEC 17025.
The accreditation is valid to the listed test methods in the Annexes of the Accreditation Certificates as well as in the "Accreditation scope test laboratories Schüco Technology Center".

Tests marked with * are not included in the accredited scope.

This report may only be published in full - unmodified in original data format or as printout.
The publication of excerpts requires the Technology Centers approval.

Replacement for Test Report: P-26-0018-T01-J03-R02
From 2026-08-20

Test specimen:	S-26-1007 Garden lamp stand - No lamp S-26-1008 Industrial enclosure - 8.0 x 7.5 x 6.5 cm
Person in charge:	Timo Amtsberg
Validity:	The results and data documented in this test report only refer to the specimen tested.

Schüco International KG | Technology Center
Karolinenstraße 1–15 · D-33609 Bielefeld
Fon +49 521 783-7000
P.O. box 102553 · 33525 Bielefeld
schueco.com/onelab | onelabtc@schueco.com

UB-0002-33

SCHÜCO

1. Task

Protection rating tests are being carried out on two Samples in accordance with DIN EN 60529:2014-09 (FR-200).
As part of the tests, the highest IP protection rating of the two samples is to be determined.

1.1. Requirements

Test description	Classification standard	Variantrequirement	Remark
IP-Code (second digit - water) / DIN EN 60529	DIN EN 60529:2014-09	Determination of the maximum class	
IP-Code (first digit - solid foreign objects) / DIN EN 60529	DIN EN 60529:2014-09	Determination of the maximum class	

1.2. Additions to/ deviations from the test method

This test is part of an interlaboretory comparison with PT SOUTH QUALITY SAS.

2. Description of test specimen

Description	Delivery date	Origin	Quantity	ID-marking
Garden lamp stand - No lamp	2026-07-23	External manufacturer	1	S-26-1007
Industrial enclosure - 8.0 x 7.5 x 6.5 cm	2026-06-23	External manufacturer	1	S-26-1008

The description of the test samples is based on the client's specification.

Definition for the dust test provided by the customer:
The samples should be tested as Category 2.

Test position definition provided by the customer:for S-26-1008:
Under normal operating conditions, these enclosures are intended to be installed with the cover opening upwards.

Further information on the test samples:

Discribtion	Articel No.
Garden lamp stand - No lamp	LIP3528-18
Industrial enclosure - 8.0 x 7.5 x 6.5 cm	LIP4240-18



S-26-1008 – Inside view



S-26-1008 – Bottom side



S-26-1008 – Top side



S-26-1008 – Water detection paste



S-26-1008 – Water detection paste



S-26-1007 – Top view



S-26-1007 – Bottom view



S-26-1007 – Water detection paste



S-26-1007 – Water detection paste



S-26-1007 – Lamp socket

All openings that are not relevant to the tests are sealed. For the test, a water detection paste is applied to relevant areas of the test samples (Type: 109641 Water Detection Paste N, manufacturer: Merck KGaA). The greyish water detection paste turns purple upon contact with water.

3. List of used measuring equipment and test facilities

Description	Manufacturer	Type	ID-No.	Next calibration
Splash Test Chamber	ITS	SPK R600	03-123-3623	2027-05
Dripping water	Kobold	KDF-2228NV000	03-097-5732	2027-06
Ingress protection test probe set	Stahl	K.A.	03-123-3292	2026-09
Dust Test Chamber	ITS	SK 1500	03-123-3622	2026-12
Spray water nozzle IPX3/4	ITS	88.1000	03-123-4027	2027-11
Web thermo-hygro-berograph	Wiesemann & Theis GmbH	57613	03-124-4157	2027-02

4. Test set-up

The following environmental conditions shall be maintained during the tests:

Measured variable	Target range	Measuring instrument
Temperature	15°C to 35°C	01-124-4157
Relative humidity	30 % to 60 %	01-124-4157
Air pressure	860 hPa to 1060 hPa	01-124-4157

To verify compliance with the specified environmental condition ranges, the environmental data are continuously logged using the measuring instument designated for this purpose. Compliance with the specified ranges is monitored by the respective test engineer.

4.1. Test setup IPX1

The dripping water protection test is carried out using a dripping water test device and with the aid of the spray water test rig (ID No. 01-123-3623). A uniform flow of water droplets is generated above the test specimen. The total test duration is 10 minutes.



After completion of the test, a visual check for water ingress is carried out.

4.2. Test setup IPX2

The dripping water protection test is carried out using a dripping water test device and with the aid of the spray water test rig (ID No. 01-123-3623). A uniform flow of water droplets is generated above the test specimen. The test is carried out in four fixed positions. The total test duration is 10 minutes.

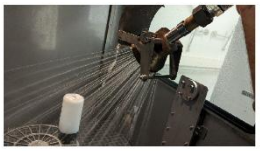


After completion of the test, a visual check for water ingress is carried out.

4.3. Test setup IPX3

The spray water test is carried out using the spray water test rig (ID No. 01-123-3623). To ensure that all relevant areas of the test sample are exposed to sufficient water during the test, the test is performed using an oscillating tube or a spray nozzle. For IPX3, the water is sprayed at angles of up to 60° from the vertical.

The test duration is five minutes, and the water flow rate is 10 l/min (±5%).



After completion of the test, a visual check for water ingress is carried out.

4.4. Test setup IPX4

The spray water test is carried out using the spray water test rig (ID No. 01-123-3623). To ensure that all relevant areas of the test sample are exposed to sufficient water during the test, the test is performed using an oscillating tube or a spray nozzle. For IPX4, the water is sprayed onto the test sample from all directions.

The test duration is five minutes, and the water flow rate is 10 l/min (±5%).



After completion of the test, a visual check for water ingress is carried out.

4.5. Test setup IP5X

The dust protection test is carried out using the dust chamber (ID No. 01-123-3622).
The test samples are assigned to Category 2 (definition according to DIN EN 60529:2014-09).
The test samples are placed in the dust chamber and exposed to talcum powder for 8 hours.



After completion of the test, a visual check for dust ingress is carried out.

5. Test procedure

Location of test: Technology Center
Schüco International KG
Karolinenstr. 1-15
33609 Bielefeld
Germany
BFE-01.07

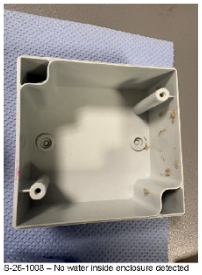
Start of test: 2026-07-23
End of test: 2026-08-11

6. Results

Test description – S-26-1007	Classification standard	Variant/ Requirement	Class/Result
IP-Code (second digit - water) / DIN EN 60529	DIN EN 60529:2014-09	Determination of the maximum class	IPX3 passed
IP-Code (first digit - solid foreign objects) / DIN EN 60529	DIN EN 60529:2014-09	Determination of the maximum class	IP5X passed

Test description – S-26-1008	Classification standard	Variant/ Requirement	Class/Result
IP-Code (second digit - water) / DIN EN 60529	DIN EN 60529:2014-09	Determination of the maximum class	IPX2 passed
IP-Code (first digit - solid foreign objects) / DIN EN 60529	DIN EN 60529:2014-09	Determination of the maximum class	IP5X passed

6.1. IPX1

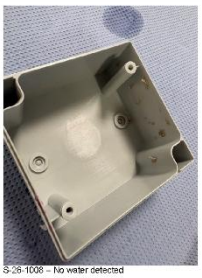


S-26-1008 – No water inside enclosure detected

6.2. IPX2



S-26-1008 – No water detected



S-26-1008 – No water detected

6.3. IPX3



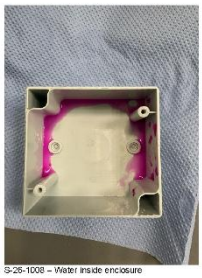
S-26-1007 – No water detected



S-26-1007 – No water detected



S-26-1008 – Water inside enclosure



S-26-1008 – Water inside enclosure

6.4. IPX4



S-26-1007 – Water detection paste's colour changed



S-26-1007 – Water in contact with one of the connectors of the Lamp socket

6.5. IP5X



S-26-1007 – No dust detected



S-26-1008 – No dust detected

7. Notes / Remarks / Comments

The test specimen S-26-1007 passed the test for demonstrating IP53 protection in accordance with DIN EN 60529:2014-09 (PR-200).
The test specimen S-26-1008 passed the test for demonstrating IP52 protection in accordance with DIN EN 60529:2014-09 (PR-200).

This test report has been generated automatically and has been approved by the responsible persons. It is valid without signature.

Bielefeld, 2026-08-21

Schüco International KG
Technology Center

p.p. Moritz Hülskämper
Test Specialist
Department Electrical Tests

p.p. Timo Amtsberg
Test Specialist
Department Electrical Tests

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 60529) 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 review was performed for participant **code 18**:

Aspect (IEC 60529)	Laboratory **CODE 18**	Most participants (*)
Review of submitted documentation and photographs (application of the test method)	No observable differences relative to the practices reported by the other participants	-

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

The absence of documented differences in this annex does not preclude the existence of factors not evident from the submitted reports.

The participant is expected to conduct an internal analysis of any deviations that may have occurred during testing (including sample preparation, mounting, test setup, and conformity with IEC 60529) and to take appropriate corrective measures.

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