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 16:59:34 -03'00'	cn=ESTEBAN DI MARCO, o=PT SOUTH QUALITY SAS, ou=SOUTH QUALITY, email=edimarco@ptsouthquality.com, c=AR 2026.10.08 09:38:23 -03'00'	cn=Emiliano Medina, o=SOUTH QUALITY, ou=PT SOUTH QUALITY SAS, email=quality@ptsouthquality.com, c=ES 2026.10.08 14:18:35 -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.

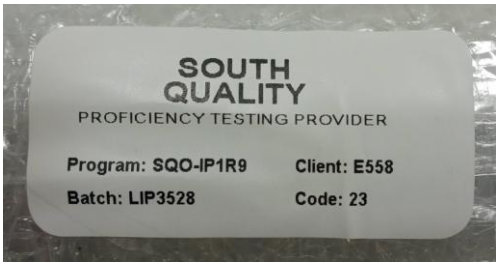
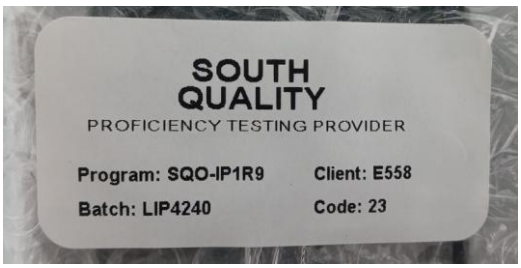
6. SAMPLE INFORMATION

The following samples were sent for testing (Participant **Code 23**):

Batch:	LIP3528
Sample ID:	23
Characteristics:	Garden lamp stand - No lamp

Batch:	LIP4240
Sample ID:	23
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 (See annex B).

- 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.

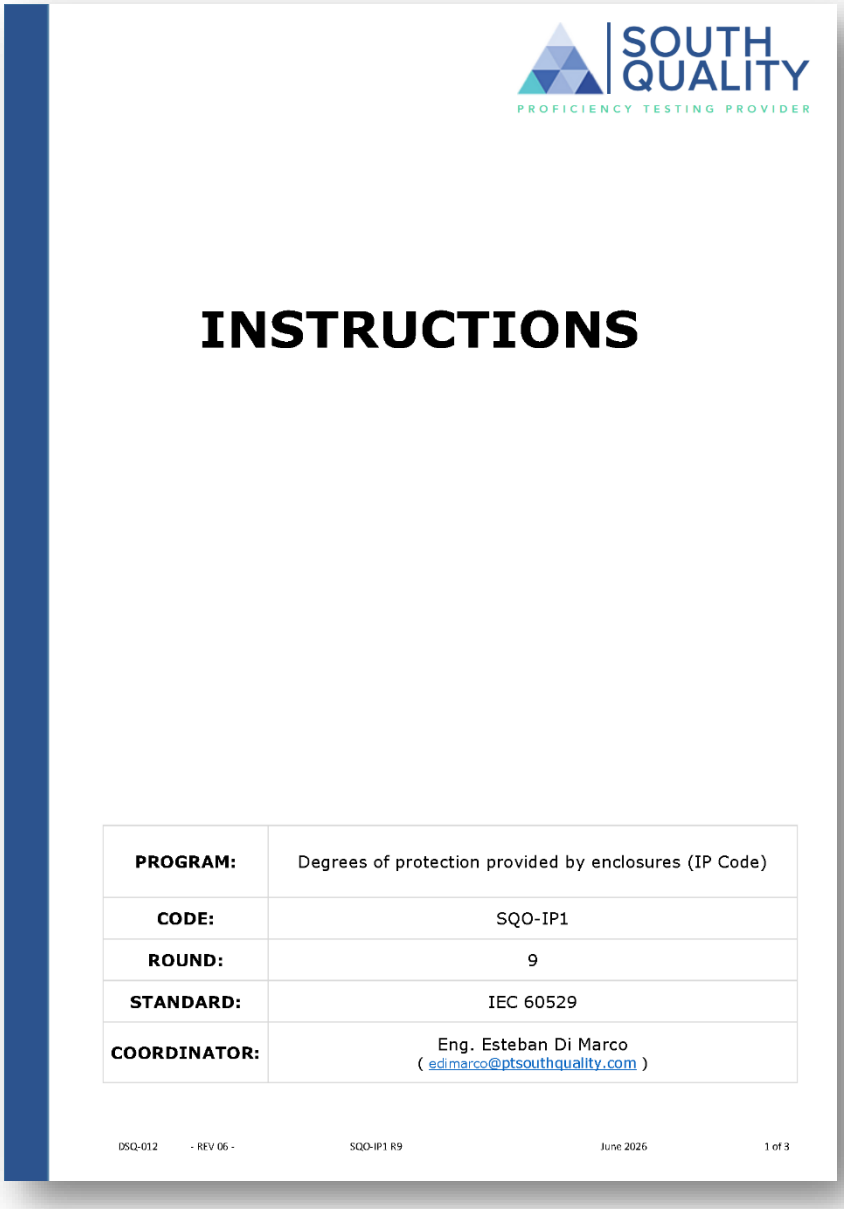
- **INSUFFICIENT** performance: An unsatisfactory result or two questionable results were obtained.

APPENDIX A

A1 - PARTICIPANT DATA

Company:	**Sebert Trillingstechniek B.V.**
Country:	Netherlands
Client ID:	E558
Contact person:	Russell Morris - Test Lab Manager
	r.morris@sebert.nl

A2 - INSTRUCTIONS



SOUTH QUALITY
PROFICIENCY TESTING PROVIDER

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

Sebert Trillingstechniek B.V.	**CODE 23**

4 - Tests involved

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

5 - Samples

CODE	SAMPLE	QUANTITY
LIP3528-23	Garden lamp stand - No lamp	1
LIP4240-23	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 #M26.001-P26.001)

Sebert Trillingstechniek B.V.

ista CERTIFIED LABORATORY

ASTM INTERNATIONAL MEMBER

Report: M26.001-P26.001 PT South Quality
Date: 4 September 2026

Ingress Protection (IP) Proficiency Testing on a Garden Lamp Stand and Industrial Enclosure



Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606

Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
Swift: ABNANL2A
Statutory Director: M.J.H. Magendans

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Client
PT South Quality SAS
Pareja 3981 - Villa Devoto
C1419GVG
Ciudad Autónoma de Buenos Aires,
Argentina

Contact Person
Mrs. E. Casas

Order confirmation
PT South Quality – Email confirmation from Esther Casas on 23-06-2026

Present at the tests
No representative of PT South Quality was present

PT South Quality Quotation
Sebert Trillingstechniek B.V. (Customer ID: E558) Proforma invoice #: 001-0047151

Tester / Author
Mr. R. Morris

Approved by
Mr. M.J.H. Magendans

No of pages
44

Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
Swift: ABNANL2A
Statutory Director: M.J.H. Magendans
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Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
Swift: ABNANL2A
Statutory Director: M.J.H. Magendans
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1. Introduction

Under contract with PT South Quality in Argentina, ingress protection (IP) proficiency testing has been carried out on **a 'Garden Lamp Stand' and 'Industrial Enclosure'**. The tests were carried out from 10 August to 03 September 2026. None of the IP tests were carried out under accreditation. The purpose of the tests was to determine if the test items meet the ingress protection stress requirements. Pass and fail criteria will be based upon the guidelines published in the IEC 60529:2013-08 test standard. In regard to the water tests, where no water is found inside the enclosure a pass shall be awarded. When water is found in an enclosure that does not contain all representative components to be able to determine whether the effects of water ingress can be harmful, a fail shall be shown. When water is found in an enclosure that does contain all representative components to be able to determine whether the effects of water ingress can be harmful, a representative judgement shall be recommended.

Based upon the results of this report, PT South Quality will evaluate the competence and ability of Sebert Trillingstechniek B.V. to perform the relevant IP tests to the required standard. The test results in this report will be related to the tested test items only.

2. Test procedure and equipment

2.1. General

Two test items have been used for the ingress protection tests, see Table 1A - 1B for the details of the test items. During the tests, the test items were in a non-operative condition. The test items which were delivered on 04 August 2026 were checked before starting the test for visual damage and no deviations were found.

Table 1A: Test item #1

Item description*	Garden Lamp Stand
Identification number*	LIP352823
Serial number*	Not available
Dimensions [LxWxH]	315 x 80 x 75 mm
Weight	0,15 kg
Figure	#1 - #2

*IFC (Information from Customer)

Table 1B: Test item #2

Item description*	Industrial Enclosure
Identification number*	LIP424023
Serial number*	Not available
Dimensions [LxWxH]	83 x 77 x 56 mm
Weight	0,1 kg
Figure	#3 - #4

*IFC (Information from Customer)

Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
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2.2. Test requirements

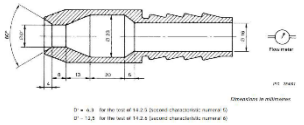
The following tables (Test A - E) present the test specifications. See Table 2 for the test plan.

Test A: Dust test

Simulation	Atmospheric effects from dust (talcum powder)
Normative document	IEC 60529:2013-08
Class	IP class 5X or 6X
Test standard	IEC 60529:2013-08 paragraph 13.4
Enclosure category 2 (without vacuum)	Enclosures where no pressure difference relative to the surrounding air is present
Talcum powder quantity	2 kg/m³
Air Velocity	2 to 3 m/s
Functional	No
Max dimensions	L170 x W110 x H110 cm
Total duration Category 2:	The enclosure under test is supported in its normal operating position inside the test chamber but is not connected to a vacuum pump. Any drain-hole normally open shall be left open for the duration of the test. The test shall be continued for a period of 8 h.
Acceptance conditions IP5X	It is the responsibility of the relevant technical committee to interpret the test results of the enclosure. Normally the protection is satisfactory if, on inspection, talcum powder has not accumulated in a quantity or location such that, as with any other kind of dust, it could interfere with the correct operation of the equipment or impair safety. Except for special cases to be clearly specified in the relevant product standard, no dust shall deposit where it could lead to tracking along the creepage distances.
Acceptance conditions IP6X	The relevant technical committee is responsible for interpreting the test results of the enclosure. The protection is considered satisfactory if, upon inspection, no talcum powder can be found to have penetrated the enclosure.
Note	The enclosure shall be deemed category 1 unless the relevant product standard for the equipment specifies that the enclosure is category 2

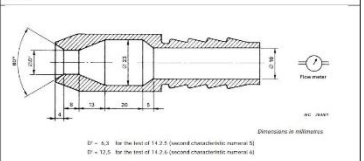
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Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
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VAT no: NL8121.08.553.B01
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Test B: Water test

Simulation	Protection against powerful water jets
Normative document	IEC 60529:2013-08
Class	IPX6
Figure	
Test standard	IEC 60529:2013-08 paragraph 14.2.6
Effective against	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects
Direction	All practicable directions
Test Parameters	Water nozzle 12,5mm diameter - distance 2,5m to 3m - water flow 100l/min (±5%)
Functional	No
Test duration	1 min/m² (at least 3 minutes)
Acceptance conditions	It is the responsibility of the relevant technical committee to interpret the test results and to specify the amount of water which may be allowed to enter the enclosure.

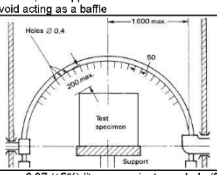
Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
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Bank no. NL95ABNA0.50.13.23.465
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Statutory Director: M.J.H. Magendans
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Test C: Water test

Simulation of	Protection against water jets
Normative document	IEC 60529:2013-08
Class	IPX5
Figure	
Test standard	IEC 60529:2013-08 paragraph 14.2.5
Effective against	Water projected in jets against the enclosure from any direction shall have no harmful effects
Direction	All practicable directions
Test Parameters	Water nozzle 6,3mm diameter - distance 2,5m to 3m - water flow 12,5l/min (±5%)
Functional	No
Test duration	1 min/m² (at least 3 minutes)
Acceptance conditions	It is the responsibility of the relevant technical committee to interpret the test results and to specify the amount of water which may be allowed to enter the enclosure.

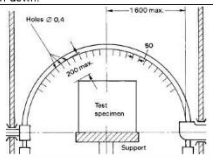
Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
Swift: ABNANL2A
Statutory Director: M.J.H. Magendans
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Test D: Water test

Simulation of	Spraying water with an oscillating tube
Normative document	IEC 60529:2013-08
Class	IPX4
Test standard	IEC 60529:2013-08 paragraph 14.2.4 a
Effective against	Water sprayed at any angle up to 360° shall have no harmful effects
Direction	Any angle up to 180° on either side of the vertical (up to 360° total)
Mounting	Placed in the centre of the semicircle. Unless specified in the relevant product standard, the support for the enclosure should be perforated so as to avoid acting as a baffle
Placement	
Test Parameters	Water volume: 0,07 (±5%) litres per minute per hole (31 holes = 2,17 l/min)
Oscillation	Spray tube to move through one complete oscillation (2 x 360°) 12 seconds
Functional	No
Max dimensions	Usable dimension chamber inside is L40 x W40 x H50cm
Test duration	5 minutes on each of the two horizontal directions (10 minutes total)
Acceptance conditions	It is the responsibility of the relevant technical committee to interpret the test results and to specify the amount of water which may be allowed to enter the enclosure.

Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
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Test E: Water test

Simulation of	Spraying water with an oscillating tube
Normative document	IEC 60529:2013-08
Class	IPX3
Test standard	IEC 60529:2013-08 paragraph 14.2.3 a
Effective against	Water sprayed at any angle up to 60° on either side of the vertical shall have no harmful effects
Direction	Any angle up to 60° on either side of the vertical, then turned 90° horizontally and the test is continued
Mounting	Placed in the centre of the semicircle. If it is not possible to wet all parts of the enclosure under test, the support of the enclosure may be moved up or down.
Placement	
Test Parameters	Water volume: 0,07 (±5%) litres per minute per hole (31 holes = 2,17 l/min)
Oscillation	Spray tube to move through one complete oscillation (2 x 120°) 4 seconds
Functional	No
Max dimensions	Usable dimension chamber inside is L40 x W40 x H50cm
Test duration	5 minutes on each of the two horizontal directions (10 minutes total)
Acceptance conditions	It is the responsibility of the relevant technical committee to interpret the test results and to specify the amount of water which may be allowed to enter the enclosure.

Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
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Table 2: Test plan

Step	Test	Test items	Remark
1	A	#1 & #2	PT South Quality defined the enclosures as category 2
2	B	#1 & #2	To be tested in all practicable directions
3	C	#1 & #2	To be tested in all practicable directions
4	D	#1 & #2	Any angle up to 180° on either side of the vertical (up to 360° total), then turned 90° horizontally and the test continued
5	E	#1	Any angle up to 60° on either side of the vertical, then turned 90° horizontally and the test continued

2.3. Description of the used apparatus and instrumentation

Apparatus and/or instrumentation	Supplier	Model Number	Serial Number	Last / Next date of Calibration, Verification and/or Inspection	
Monitoring of the environmental conditions	E+E Elektronik	HUMOLOG20 THIP	056.0420. 0802.034	22/04/26	22/04/28
Weighing instrument	Weegtechniek Holland	SATEX	2811072	12/06/26	12/06/28
Sand and Dust Test Chamber	ACE Technology	ASD-2000	ACE2020 09002	08/07/26	08/07/28
IPX6 Spray Nozzle Head	HK Bomad Technology LTD	BND-IPX6	BND2020 1125-10	04/02/25	04/02/27
IPX5 Spray Nozzle Head	HK Bomad Technology LTD	BND-IPX5P	BND2020 1125-09	04/02/25	04/02/27
Box Rain Test Chamber	ACE Technology	BR-1200	ACE2020 09003	15/11/25	15/11/27
Weighing instrument	Papro.nl	BFC-7	BFC2025 0110137	12/06/26	12/06/28
Temperature and humidity data recorder A	ATAL	ATV-11E	22930683	05/08/26	05/08/28
Temperature (4ch) data recorder B	ATAL	ATU-05	20271784	01/07/25	01/07/27

3. Ingress Protection Tests

The IP dust and water tests have been carried out according to test standard IEC 60529:2013-08 edition 2.2 - degree of protection - provided by enclosures (IP code). This standard applies to the classification of degrees of protection provided by enclosures for electrical equipment with a rated voltage not exceeding 72,5kV.

3.1. Test A: Dust test class IP5X / IP6X

The dust tests (class IP5X or IP6X – dust protection) have been carried out in a 'Sand and Dust Test Chamber'. The amount of protection provided by the enclosure determines whether the test item can be considered to have achieved an IP5X or IP6X protection rating. If no deposit of dust is observable inside the enclosure at the end of the test, the enclosure can be considered to satisfy an IP6X classification. If ingress of dust is discovered but does not penetrate in sufficient quantity to interfere with the satisfactory operation of the apparatus or impair safety the enclosure can be considered to satisfy an IP5X classification. The test will be carried over a period of 8 hours. On this occasion, both test items were classified as category 2 type enclosures with no requirement for a reduction in air pressure to be created in either of the enclosures. See Figure #5 for the test setup.

3.1.1. Results

Two test items have been used for the dust test (IP5X / IP6X). On completion of the test, the test items were wiped clean before opening to prevent contamination of the results. See Table 3 for an overview of the results.

Table 3: Test item results

Test Item	Test Conditions	Enclosure Category	Dust found inside	Results/remarks*	Figure
#1	Suspended dust (no reduction of air pressure)	2	Yes	Only a small amount of dust found inside enclosure indicating a successful IP5X classification	#6 - #11
#2	Suspended Dust (no reduction of air pressure)	2	No	No dust found inside enclosure indicating a successful IP6X classification	#12 - #17

3.2. Test B: Powerful water jets test class IPX6

The powerful water jets test (class IPX6 – protected against powerful water jets) was carried out using a 12,5mm nozzle with sufficient pressure to deliver water at a rate of 100l/min (±5%). The test items were sprayed from a distance of between 2,5 to 3 meters for a minimum of 3 minutes in all practicable directions. See Figure #18 for an example of the test setup.

3.2.1. Results

Two test items have been used for the powerful water jets test (IPX6). On completion of the test, the test items were wiped clean before opening to prevent contamination of the results. See Table 4 for an overview for the results.

Table 4: Test item results

Test item	Test conditions	Test duration	Water found inside	Results/remarks*	Figure
#1	IPX6 Powerful water jets	3 mins	Yes	When tested in the intended upright orientation, only a few small drops of water were found to have entered the enclosure. However, this being a portable luminaire intended for outside use where the risk of displacement is high, the item was also tested in a horizontal orientation. In this position, the item was found to fill with a considerable amount of water via a hole intended to be used for cabling. This made it unsafe if it were to become displaced. Although water was able to drain out via the hole, as a portable luminaire intended for outside use, an IPX6 classification was deemed not to have been achieved.	#19 - #24
#2	IPX6 Powerful water jets	3 mins	Yes	A considerable amount of water was found to penetrate inside the enclosure regardless of the test item orientation. When tested in the intended vertical orientation, the water jet was able to dislodge the transparent protective screen allowing full access of water. For that reason, an IPX6 classification was deemed not to have been achieved.	#25 - #28

3.3. Test C: Water jets test class IPX5

The water jets test (class IPX5 – protected against water jets) was carried out using a 6,3 mm nozzle with sufficient pressure to deliver water at a rate of 12,5l/min (±5%). The test items were sprayed from a distance of between 2,5 to 3 meters for a minimum of 3 minutes in all practicable directions. See Figure #29 for an example of the test setup.

3.3.1. Results

Two test items have been used for the water jets test (IPX5). On completion of the test, the test items were wiped clean before opening to prevent contamination of the results. See Table 5 for an overview of the results.

Table 5: Test item results

Test item	Test conditions	Test duration	Water found inside	Results/remarks*	Figure
#1	IPX5 Water jets	3 mins	Yes	When tested in the intended upright orientation, only a few small drops of water were found to have entered the enclosure. However, this being a portable luminaire intended for outside use where the risk of displacement is high, the item was also tested in a horizontal orientation. In this position, the item was found to fill with a considerable amount of water via a hole intended to be used for cabling. This made it unsafe if it were to become displaced. Although water was able to drain out via the hole, as a portable luminaire intended for outside use, an IPX5 classification was deemed not to have been achieved.	#30
#2	IPX5 Water jets	3 mins	Yes	A large amount of water was found to penetrate inside the enclosure regardless of the test item orientation. For that reason, an IPX5 classification was deemed not to have been achieved.	#31 - #33

3.4. Test D: Spraying water test class IPX4

The spraying water test (class IPX4 – protected against spraying water) was carried out in the **'Box Rain Test Chamber'. The sp**rayed water, delivered at a rate of 0,07 litres per minute per hole under an angle of ±160° shall have no harmful effects. The test items were mounted vertically and tested on two different horizontal axes. The testing was carried out for 10 minutes in total, see Figure #34 for the test setup.

3.4.1. Results

Two test items have been used for the spraying water test IPX4. On completion of the test, the test items were wiped clean before opening to prevent contamination of the results. See Table 6 for an overview of the results.

Table 6: Test item results

Test item	Test conditions	Test duration	Water found inside	Results/remarks*	Figure
1	IPX4 Spraying water	10 mins	Yes	Some water droplets were found inside the enclosure. For that reason, an IPX4 classification was deemed not to have been achieved.	#35 - #38
2	IPX4 Spraying water	10 mins	No	No water found inside the enclosure. For that reason, an IPX4 classification was deemed to have been achieved.	#39 - #43

3.5. Test E: Spraying water test class IPX3

The spraying water test (class IPX3 – protected against spraying water) was carried out in the **'Box Rain Test Chamber'. The sp**rayed water, delivered at a rate of 0,07 litres per minute per hole under an angle of up to 60° shall have no harmful effects. The test item was mounted vertically and tested on two different horizontal axes. The testing was carried out for 10 minutes in total, see Figure #44 for the test setup.

3.5.1. Results

One test item has been used for the spraying water test IPX3. On completion of the test, the test item was wiped clean before opening to prevent contamination of the results. See Table 7 for an overview of the results.

Table 7: Test item results

Test item	Test conditions	Test duration	Water found inside	Results/remarks*	Figure
1	IPX3 Spraying water	10 mins	No	No water found inside the enclosure. For that reason, an IPX3 classification was deemed to have been achieved.	#45 - #46

3.6. Laboratory ambient (during test)

See Annex A1 for the environmental measurements during the test sequence.

Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
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4. Conclusion and remarks

Two test items have been subjected to Ingress Protection tests according to the following normative document:

- IEC 60529:2013-08 edition 2.2 - degree of protection - provided by enclosures (IP code).

The classifications achieved for test item **#1 – Garden Lamp Stand – IP53**
The classifications achieved for test item **#2 – Industrial Enclosure – IP64**

See the following table for the summary of the test results:

Test A: Dust test class IP5X / IP6X	On test item #1, only a small amount of dust found inside enclosure indicating a successful IP5X classification. On test item #2, no dust was found inside enclosure indicating a successful IP6X classification.
Test B: Powerful water jets class IPX6	For both test items, a considerable amount of water was able to penetrate inside the enclosures. For test item #1, when tested in the intended upright orientation, only a few small drops of water were found to have entered the enclosure. However, this being a portable luminaire intended for outside use where the risk of displacement is high, the item was also tested in a horizontal orientation. In this position, the item was found to fill with a considerable amount of water via a hole intended to be used for cabling. This made it unsafe if it were to become displaced. Although water was able to drain out via the hole, as a portable luminaire intended for outside use, it was deemed unsafe. For test item #2, a considerable amount of water was found to penetrate inside the enclosure regardless of the test item orientation. When tested in the intended vertical orientation, the water jet was able to dislodge the transparent protective screen allowing complete access of water. This means that an IPX6 classification has not been achieved for either test item.
Test C: Water jets class IPX5	For both test items, a considerable amount of water was able to penetrate inside the enclosures. For test item #1, when tested in the intended upright orientation, only a few small drops of water were found to have entered the enclosure. However, this being a portable luminaire intended for outside use where the risk of displacement is high, the item was also tested in a horizontal orientation. In this position, the item was found to fill with a considerable amount of water via a hole intended to be used for cabling. This made it unsafe if it were to become displaced.

Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
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	Although water was able to drain out via the hole, as a portable luminaire intended for outside use, it was deemed unsafe. For test item #2, a considerable amount of water was found to penetrate inside the enclosure regardless of the test item orientation. This means that an IPX5 classification has not been achieved for either test item.
Test D: Spraying water class IPX4	On test item #1, although only a small amount of water was found to have entered the enclosure in the form of tiny droplets; without being able to inspect the electrical connections under the lamp fitting we would not recommend that an IPX4 classification to have been achieved. On test item #2, no water was found to have entered the enclosure and should be considered to have achieved an IPX4 water classification.
Test E: Spraying water class IPX3	Only test item #1 was used for this water test. No water was found to have entered the enclosure and should be considered to have achieved an IPX3 water classification.

PT South Quality will perform an evaluation of the test results after an analysis of the test sequences and results presented in this report.

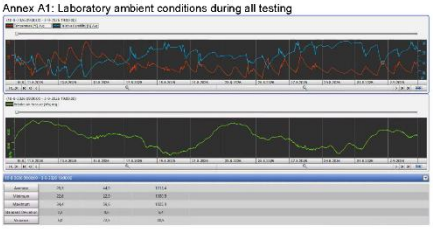
Approved by
M.J.H. Magendans
Director • Test Specialist

Testing carried out by
R. Morris
Test Lab Manager

Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
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VAT no: NL8121.08.553.B01
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Annexes

Annex A1: Laboratory ambient conditions during all testing



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The Netherlands
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Tel: +31 010 52 40 606

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VAT no: NL8121.08.553.B01
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Figures

Figure 1: Test item #1



Figure 2: Test item #1



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Figure 3: Test item #2



Figure 4: Test item #2



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Figure 5: Test A Dust test IP5X / IP6X test setup



Figure 6: Test item #1, Dust test IP5X results



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The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606

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VAT no: NL8121.08.553.B01
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Figure 7: Test item #1, Dust test IP5X results



Figure 8: Test item #1, Dust test IP5X results



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Figure 9: Test item #1, Dust test IP5X results (dust found)



Figure 10: Test item #1, Dust test IP5X results (dust found)

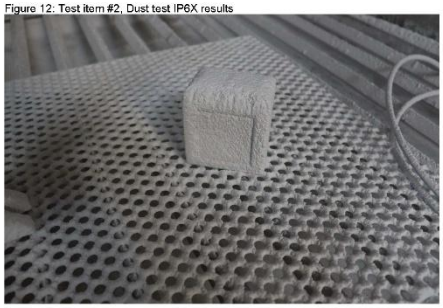


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Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
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Figure 11: Test item #1, Dust test IP5X results (dust found)



Figure 12: Test item #2, Dust test IP6X results



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The Netherlands
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Tel: +31 010 52 40 606
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Figure 13: Test item #2, Dust test IP6X results



Figure 14: Test item #2, Dust test IP6X results



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The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
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Figure 15: Test item #2, Dust test IP6X results (no dust found)

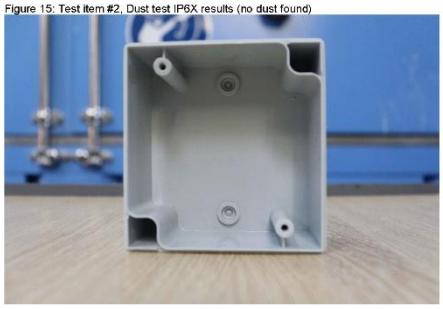


Figure 16: Test item #2, Dust test IP6X results (no dust found)



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2661 DB Bergschenhoek
The Netherlands
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VAT no: NL8121.08.553.B01
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Figure 17: Test item #2, Dust test IP6X results (no dust found)

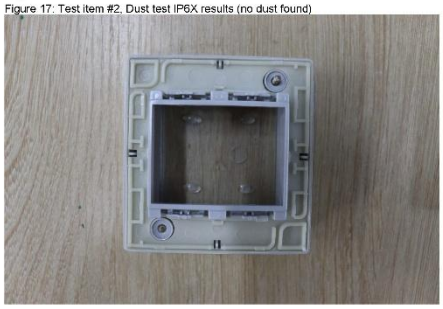
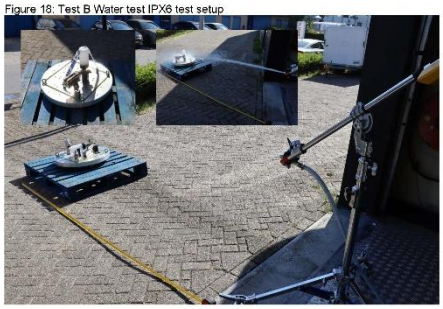


Figure 18: Test B Water test IPX6 test setup



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Weg en Land 18
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The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
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Figure 19: Test item #1, Water test IPX6 results (horizontal orientation)

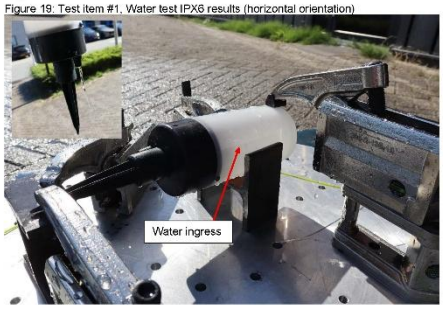


Figure 20: Test item #1, Water test IPX6 results (vertical orientation)

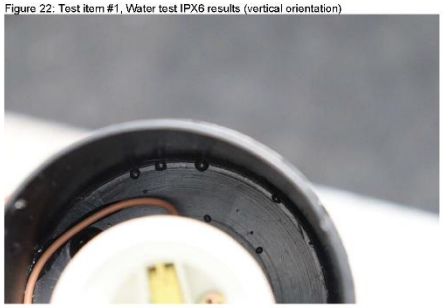


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Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
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Figure 21: Test item #1, Water test IPX6 results (vertical orientation)



Figure 22: Test item #1, Water test IPX6 results (vertical orientation)



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Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
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Figure 23: Test item #1, Water test IPX6 results (vertical orientation)



Figure 24: Test item #1, Water test IPX6 results (vertical orientation)



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Weg en Land 18
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The Netherlands
E-mail: info@sebert.nl
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VAT no: NL8121.08.553.B01
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Figure 25: Test item #2, Water test IPX6 setup

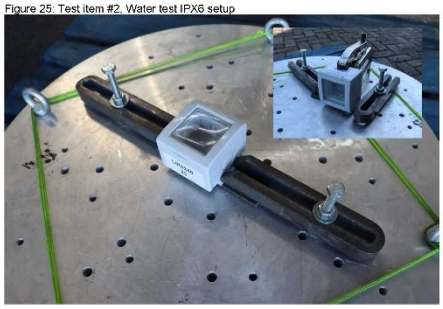
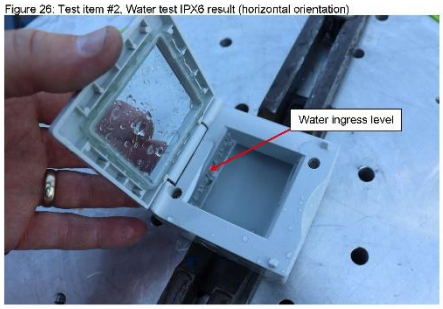


Figure 26: Test item #2, Water test IPX6 result (horizontal orientation)



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2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
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Figure 27: Test item #2, Water test IPX6 result (vertical orientation)

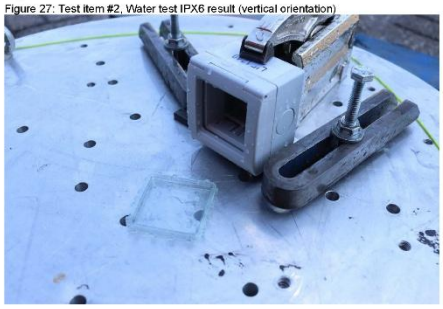
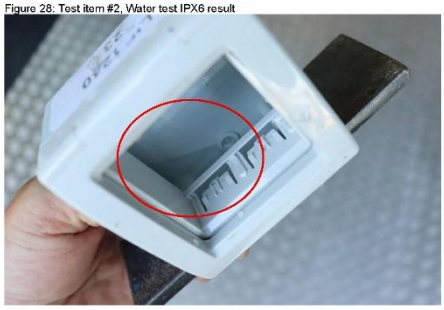


Figure 28: Test item #2, Water test IPX6 result



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2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
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VAT no: NL8121.08.553.B01
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Figure 29: Test C Water test IPX5 test setup

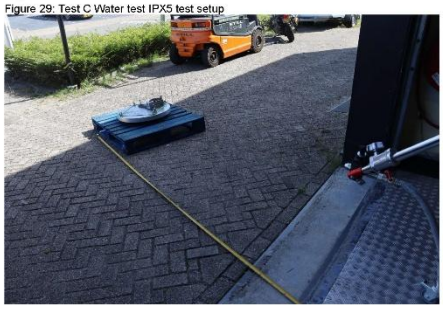


Figure 30: Test item #1, Water test IPX5 result



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The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
Bank no. NL95ABNA0.50.13.23.465
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Figure 31: Test item #2, Water test IPX5 result

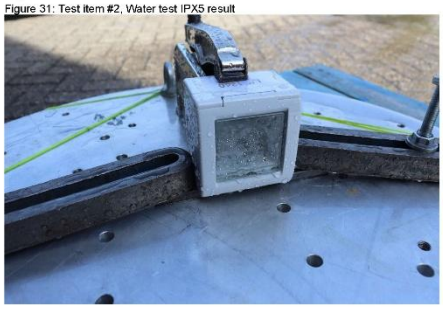


Figure 32: Test item #2, Water test IPX5 result



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The Netherlands
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Figure 33: Test item #2, Water test IPX5 result

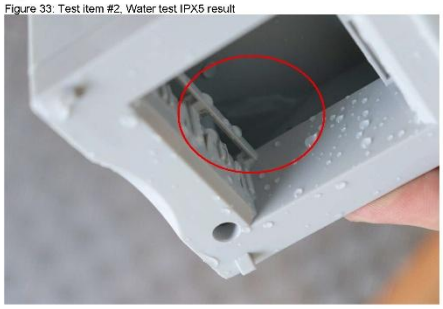
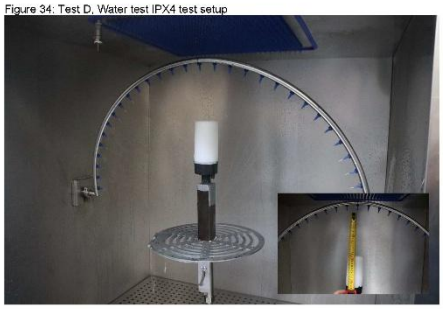


Figure 34: Test D, Water test IPX4 test setup

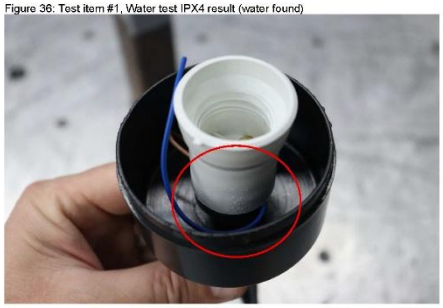


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2661 DB Bergschenhoek
The Netherlands
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VAT no: NL8121.08.553.B01
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Figure 35: Test item #1, Water test IPX4 result



Figure 36: Test item #1, Water test IPX4 result (water found)

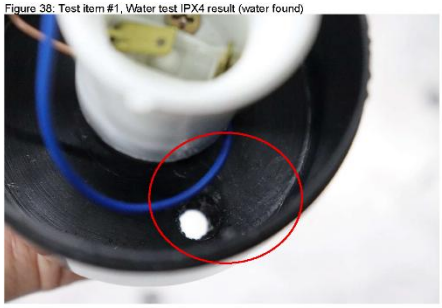


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2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
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Figure 37: Test item #1, Water test IPX4 result (water found)



Figure 38: Test item #1, Water test IPX4 result (water found)

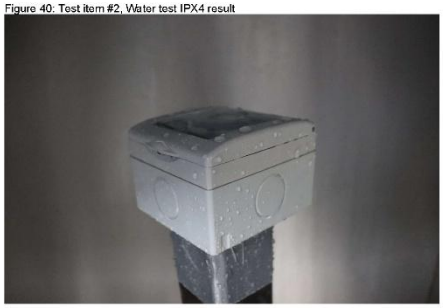


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Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
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Figure 39: Test item #2, Water test IPX4 result



Figure 40: Test item #2, Water test IPX4 result



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Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
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Figure 41: Test item #2, Water test IPX4 result



Figure 42: Test item #2, Water test IPX4 result (no water found)



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2661 DB Bergschenhoek
The Netherlands
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Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
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Figure 43: Test item #2, Water test IPX4 result (no water found)

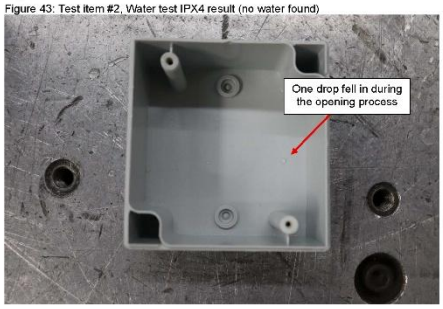


Figure 44: Test E, Water test IPX3 test setup



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The Netherlands
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Figure 45: Test item #1, Water test IPX3 result (no water found)



Figure 46: Test item #1, Water test IPX3 result (no water found)

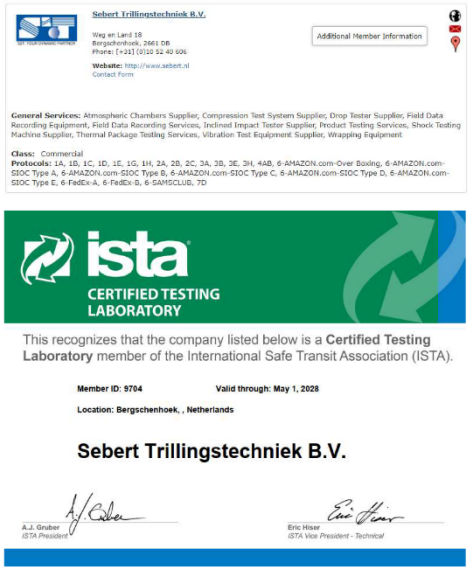


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Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
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Abbreviations

Acc	Acceleration
ASD	Acceleration Spectral Density
AvC	Average Control
dB	decibel
DOF	Degrees of Freedom
Drive	Voltage output of the controller used to drive the shaker
DUT	Device under test
Dwell	Endurance test on 'fixed' frequency
Fail	Criteria if the DUT is tested outside the described TS of the normative doc
Fn	Natural frequency
g	Acceleration due to gravity (equal to 9,81 m/s^2)
Hz	Hertz
IFC	Information from customer
kg	Kilogram
Manuf	Manufacturer
ms	Milliseconds, nominal duration
N	Newton (force)
Oct/min.	Sweep rate
Oper	Operational
Pa	Pressure
Pass	Criteria if the DUT is tested as described in the TS of the required normative doc
PK	Peak
PK-PK	Peak to Peak
PSD	Power Spectral Density
Q	Quality, Sharpness measure of a resonance
Res	Resonance
RS	Resonance Survey
RMS	Root Mean Square
Seq	Sequence
S/N	Serial Number
SRS	Shock Response Spectrum
Sweep	One sweep up or down
TS	Test Specification
V	Voltage

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Sebert Trillingstechniek B.V.
Weg en Land 18
2661 DB Bergschenhoek
The Netherlands
E-mail: info@sebert.nl
Tel: +31 010 52 40 606
Chamber of Commerce: 24346465
VAT no: NL8121.08.553.B01
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E-mail: info@sebert.nl
Tel: +31 010 52 40 606
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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 23**:

Aspect (IEC 60529)	Laboratory **CODE 23**	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 report.

The participant should evaluate whether it is necessary to take corrective action considering its performance, considering sample preparation, mounting, test setup, and conformity with IEC 60529.

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