

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electrical relays – Tests and measurements –
Part 11: Enclosure protection and degree of protection**

**Relais électriques – Essais et mesurages –
Partie 11: Protection des enveloppes et degré de protection**

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.70

ISBN 978-2-8327-0154-6

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ELECTRICAL RELAYS – TESTS AND MEASUREMENTS –**Part 11: Enclosure protection and degree of protection**

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The text of this International Standard is based on the following documents:

Draft	Report on voting
94/1058/FDIS	94/1109/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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ELECTRICAL RELAYS – TESTS AND MEASUREMENTS –

Part 11: Enclosure protection and degree of protection

1 Scope

This part of IEC 63522 is used for testing electrical relay enclosures along with the appropriate severities and conditions for measurements and tests designed to assess the ability of DUTs to perform under expected conditions of transportation, storage and all aspects of operational use.

This document defines standard test methods for appropriate enclosure sealing testing.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-17:2023, *Environmental testing – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-68:1994, *Environmental testing – Part 2-68: Tests – Test L: Dust and sand*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60529:1989/AMD1:1999

IEC 60529:1989/AMD2:2013

[IEC 63522-11:2025](#)

[https://www.intertek.com/standards/iec-63522-11-2025](#), *Electrical relays – Tests and measurements – Part 0: General and guidance*

IEC 63522-4:2024, *Electrical relays – Tests and measurements – Part 4: Dielectric strength test*

IEC 63522-7:2024, *Electrical relays – Tests and measurements – Part 7: Functional tests*

IEC 63522-15:2024, *Electrical relays – Tests and measurements – Part 15: Robustness of terminals*

IEC 63522-19, *Electrical relays – Tests and measurements – Part 19: Electrical endurance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 63522-0 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

¹ Under preparation. Stage at the time of publication: IEC CCDV 63522-0:2024.

3.1 relay technology category

RT

categories of relays, based upon levels of environmental protection

Note 1 to entry: Six categories are in use (RT0 to RTV).

4 Test procedure

4.1 Purpose

The purpose of the test procedure is to determine the effectiveness of the relay enclosure in regard to either sealing or protection against ingress of dust and water.

Refer to Annex B for relay technology categories.

4.2 Procedure

4.2.1 Enclosure protection

4.2.1.1 Procedure for RT 0 relays

No test procedure applies.

4.2.1.2 Procedure for RT I relays – Dust protection

This test applies to relays according to the category relay technology I (RTI) only.

This test shall be carried out in accordance with test La2 of IEC 60068-2-68. The non-operated relay shall be mounted with standard mounting position pin downwards if not otherwise specified in the test chamber. The air pressure within the relay shall be that of the ambient air pressure in the test chamber (category 2 enclosure). The relay shall be subjected to talc (hydrated magnesium silicate) for 8 h. After a recovery period of 2 h under normal atmospheric conditions and after cleaning (removal of external surface dust) the test samples shall be submitted to visual and functional measurement.

4.2.1.3 RT II to V – Sealing

4.2.1.3.1 General

A suitable soldering process in accordance with the manufacturer's specification shall be chosen from IEC 63522-16 and all DUTs shall go through the selected soldering process.

4.2.1.3.2 Procedure for RT II relays

The DUT shall be exposed to a specified flux process according to the product specification.

NOTE Typical flux processes are foam or spray processes.

4.2.1.3.3 Procedure for RT III relays

The sealing test shall be carried out by immersion of the RTIII relay in a liquid at a temperature in accordance with test Qc, method 1 or 2 of IEC 60068-2-17. Immersion times shorter than 10 min may be specified by the manufacturer. Bubbles shall not exceed the limits given in IEC 60068-2-17.

4.2.1.4 Procedure for RT IV and V for relays

4.2.1.4.1 Procedure – Sealing test method Qk

The helium detection test shall be carried out in accordance with test Qk, method 1 or 2 of IEC 60068-2-17. Where method 2 is used and the existence of a gross leak cannot be ruled out, it shall be followed by method 1.

Further requirements on the helium sniffer test are given in Annex A.

The helium leak rate is not equal to the leak rate of the gases normally used within sealed relays.

If the time interval between sealing and testing has been more than 48 h, the relay shall be exposed to an atmosphere of helium at high pressure.

The difference in pressure (inside DUT to surrounding ambient) and the duration of exposure shall be as prescribed by the manufacturer.

After the exposure, the absorbed helium shall be cleaned from the surface as prescribed by the manufacturer.

4.2.1.4.2 Procedure – Sealing test method Ql

This test applies for reed switches and high voltage vacuum reed switches as an alternative to the Qk test.

The sealing test shall be in accordance with test Ql of IEC 60068-2-17:2023.

4.2.1.4.3 Procedure – Arc time duration test

This test applies for heavy duty reed switches only. <https://standards.iteh.ai/catalog/standards/iec/03139e32-9654-44e1-9ac9-7a6dc4301e27/iec-63522-11-2025>

The test shall be performed as follows:

- a) Arcing time less than
 - i) 60 ms for 3A types;
 - ii) 100 ms for 5A types;
- b) Coil voltage: 150 % of must operate voltage;
- c) Load voltage: 100 V DC to 110 V DC;
- d) Load current: 0,5 A to 0,55 A;
- e) Total number of operations: 3.

The test setup shall be in accordance with IEC 63522-19 and carried out in ambient environmental conditions.

4.2.2 Degree of protection (IP code)

4.2.2.1 General

For relays, the first digit, i.e., the solid particle protection defined in IEC 60529, may apply and can be tested as the component shall be used in the final application.

In any case, there is no direct linkage between the relay technology category and the degree of protection (IP code) given as the RT categories are linked to the function and handling process compared to the IP code which is linked to the avoidance of electrical shock.

The first digit indicates the level of protection that the enclosure provides against access to hazardous parts (e.g., electrical conductors, moving parts) and the ingress of solid foreign objects.

See Table 1 for the degree of protection against access to hazardous parts indicated by the first characteristic numeral.

Table 1 – Degree of protection against access to hazardous parts indicated by the first characteristic numeral

Level sized	Effective against	Description
X	—	X means there is no data available to specify a protection rating with regard to this criterion.
0	Non-protected	No protection against contact and ingress of objects
1	> 50 mm 2,0 in	Any large surface of the body, such as the back of a hand, but no protection against deliberate contact with a body part
2	> 12,5 mm 0,49 in	Fingers or similar objects
3	> 2,5 mm 0,098 in	Tools, thick wires, etc.
4	> 1 mm 0,039 in	Most wires, slender screws, large ants, etc.
5	Dust protected	Ingress of dust is not entirely prevented, but it must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment.
6	Dust-tight	No ingress of dust; complete protection against contact (dust-tight). A vacuum must be applied. Test duration of up to 8 h based on airflow.

The second characteristic numeral indicates the degree of protection provided by enclosures with respect to harmful effects on the equipment due to the ingress of water.

See Table 2 for the degree of protection against ingress of water indicated by the second characteristic numeral.

Table 2 – Degree of protection against access to hazardous parts indicated by the second characteristic numeral

Second characteristic numeral	Effective against	Description
X	—	X means there is no data available to specify a protection rating with regard to this criterion.
0	Non-protected	No protection against contact and ingress of objects
1	Protected against vertically falling water drops	Vertically falling drops shall have no harmful effects
2	Protected against vertically falling water drops when enclosure tilted up to 15°	Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical
3	Protected against spraying water	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects

Second characteristic numeral	Effective against	Description
7	Protected against the effects of temporary immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time.
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7.
9	Protected against high pressure and temperature water jets	Protected against high pressure and temperature water jets

4.2.2.2 Procedure

Tests shall be performed according to IEC 60529:1989, Clause 5 and Clause 6, IEC 60529:1989/AMD1:1999, Clause 5 and IEC 60529:1989/AMD2:2013, Clause 5 and Clause 6.

4.3 Conditions

4.3.1 Conditions for RT I relays

The conditions to be specified are the following:

- a) pressure reduction inside the relay, if required;
- b) position of the relay, if other than normal operating position.

4.3.2 Conditions for RT II to V relays

The conditions to be specified are the following:

- a) procedure or sequence of procedures, and methods used within them;
- b) procedure 1: immersion time if different from 10 min;
- c) procedure 2:
 - i) severity, if different from 1 000 h;
 - ii) absolute immersion pressure, if required;
 - iii) free internal volume V (cm³);
 - iv) maximum leak rate, or time constant.

4.3.3 Conditions for degree of protection (IP code)

The test conditions to be specified are the following:

- a) the IP level,
- b) any preparation of the sample,
- c) in kind of IP5X (dust protected): Definition of mandatory dust-free areas inside the relay.