IEC 63522-13

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrical relays – Tests and measurements –
Part 13: Corrosive atmospheres due to sulfur impact

Relais électriques – Essais et mesurages –
Partie 13: Atmosphères corrosives – Atmosphères polluées

IEC 63522-13:2024-12(en-fr)

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ELECTRICAL RELAYS – TESTS AND MEASUREMENTS –

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FOREWORD

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IEC 63522-13 has been prepared by IEC technical committee 94: Electrical relays. It is an International Standard.

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

FDIS	Report on voting
94/1051/FDIS	94/1080/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.

A list of all parts of the IEC 63522 series, published under the general title *Electrical relays – Tests and measurements,* can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

ELECTRICAL RELAYS – TESTS AND MEASUREMENTS –

Part 13: Corrosive atmospheres due to sulfur impact

1 Scope

This document is used for testing electromechanical elementary relays (electromechanical relays, reed relays, reed contacts, reed switches and technology combinations of these) and for evaluating their ability to perform under expected conditions of transportation, storage and all aspects of operational use.

This document defines a standard test method to simulate impacts of sulfuric atmospheres to relays. The test conditions simulate an artificial situation and allow a performance comparison for usability of the devices under test (DUT) with regard to known and existing switching solutions.

The test is a static test without actual operation of the DUT to simulate a worst-case scenario for corrosion, since corrosion increases over time. The corrosion layer can potentially create contact sticking, increase resistance or other undesired effects in the relay. Those aspects can be affected by DUT actuations during the test, which can destroy the corrosion layers or hide relevant long-term effects.

In addition to polluted atmospheres, the suitability of the DUT for use and/or storage in corrosive atmospheres can be assessed in a salt-laden atmosphere as described in IEC 63522-44.

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 60068-2-42:2003, *Environmental testing – Part 2-42: Tests – Test Kc: Sulfur dioxide test for contacts and connections*

IEC 60068-2-43:2003, *Environmental testing – Part 2-43: Tests – Test Kd: Hydrogen sulphide test for contacts and connections*

IEC 63522-0:—, *Electrical relays – Tests and measurements – Part 0: Testing – General and guidance*[1]

IEC 63522-1, *Electrical relays – Tests and measurements – Part 1: Visual inspection and check of dimensions*[2]

IEC 63522-6, *Electrical relays – Tests and measurements – Part 6: Contact-circuit resistance (or voltage drop)*

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[1] First edition under preparation. Stage at the time of publication: IEC CDV 63522-0:2024.

[2] First edition under preparation. Stage at the time of publication: IEC CDV 63522-1:2023.

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

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

4 Test procedure

4.1 Purpose

The purpose of the test procedure is to assess the resistance of a DUT to atmospheres polluted with sulfur dioxide or hydrogen sulfide. The primary purpose is to evaluate the effects of a polluted atmosphere within a short time after the test to gain repeatable data, because storage conditions after the test may alter the test results.

4.2 Procedure

The tests stated in this document shall be carried out with appropriate test conditions and severities, as well as suitable measurements conditions.

The DUT shall be in a new and clean condition, mounted as in service or mounted as specified by the manufacturer. The test shall be performed under applicable reference conditions given in IEC 63522-0:—[3], 4.4.

The test shall be carried out in accordance with the sulfur dioxide test according to test Kc of IEC 60068-2-42 and/or with the hydrogen sulfide test according to test Kd of IEC 60068-2-43. A different pollution severity or pollution content of the atmosphere in parts per million (ppm) may be defined.

There shall be no preconditioning, unless otherwise specified by the manufacturer.

The initial value of the contact circuit resistance of all DUT contacts shall be measured.

Then the DUT is placed in the test chamber without any electrical contact load and energization supply and is kept in the polluted atmosphere for a period as specified in 4.3 f). After DUT removal from the polluted atmosphere and a recovery period of not more than 2 h under conditions specified by the manufacturer, preferably the applicable reference conditions as given in IEC 63522-0:—, 4.4, the functional performance of each DUT shall be evaluated and the contact circuit resistance of all of its contacts shall be measured.

Depending on the underlying corrosion mechanism, in some cases, the contact resistance can increase further during storage in air after the test. Thus, the relevant contact resistance can consistently be measured only within 2 h after removal from the polluted atmosphere. For a detailed observation of the corrosion mechanism, a regular recording of the contact resistance during the test is recommended (electrical connections have to be fed outside of the test chamber). In addition, the contact resistance may be checked again also after several days after the test.

[3] First edition under preparation. Stage at the time of publication: IEC CDV 63522-0:2024.

4.3 Conditions

The conditions to be specified are the following:

a) test with sulfur dioxide or hydrogen sulfide, or both (if both tests are carried out, then sulfur dioxide shall be tested for first, followed by hydrogen sulfide);

b) composition and conditions of testing atmosphere, in accordance with IEC 60068-2-42:2003, Clause 4 (25 ± 5 ppm sulfur dioxide) and IEC 60068-2-43:2003, Clause 4 (10 ppm to 15 ppm hydrogen sulfide), respectively, if not specified otherwise by a detailed application specification;

c) DUT contact state open or closed, or both. If both states are specified to be used for the test, it shall be done on separate DUTs. Each set of DUT with contacts either open or closed shall be considered as an independent test on a new set of DUTs;

d) preconditioning, only if required;

e) initial value(s) of contact circuit resistance as specified in IEC 63522-6 (irrespective of test condition 4.3 c));

f) duration of the test (recommended values: 4, 10, 21 days);

g) functional testing parameters as specified in IEC 63522-7;

h) energization of the DUT coil shall be at rated operate value unless otherwise stated by the manufacturer;

i) recovery conditions as specified by the manufacturer, preferably the applicable reference conditions as given in IEC 63522-0:—, 4.4.

NOTE Tests with hydrogen sulfide are primarily intended for tests of DUTs with contacts with silver or silver alloy surfaces, but also copper materials in general. Tests with sulfur dioxide are mainly intended for any other contact surface alloys. Both tests can be carried out in sequence as defined, in order to have the most aggressive atmosphere simulation. A mixed flow gas test according to IEC 60068-2-60 is not appropriate, as concentrations are too weak and test duration would be too long for relevant results.

5 Evaluation

5.1 General

The evaluation results shall only refer to the situation after full completion of the tests Kc, Kd or Kc followed by Kd. If both tests are run sequentially, an interim evaluation after Kc may be carried out as per the bulleted list below.

Final evaluation shall be done and documented as follows:

- the contact resistance is measured in accordance with IEC 63522-6. The contact circuit resistance value(s) shall not exceed twice the specified initial value(s), or shall not exceed a value either specified by the manufacturer or agreed by the parties, representing a permissible heat rise. For that, IEC 60068-2-42:2003, 6.3 and/or IEC 60068-2-43:2003, 6.3 shall be adhered to;
- functional test as specified in IEC 63522-7. The DUT shall respond to each functional test step with its intended contact state for each defined voltage step;
- visual inspection as specified in IEC 63522-1 for RT II, RT II and RT III relays, only. There shall be no evidence of corrosion, peeling and chipping, or of mechanical deterioration that could impair operation. The visual inspection is not required for RT IV and RT V relays, as they are sealed;
- any other measurements, if required.

5.2 Test report

If this document is applied as a part of a test record of another standard, then the results shall be reported as required in the other standard.

Otherwise, it is recommended to issue a dedicated test report in accordance with this document.

The test report shall contain all the information necessary to reproduce the test. In particular, the following shall be recorded.

The test report shall include at least the following:

- Number of DUTs under test, numbered individually;
- Initial data of each of the DUTs, as required by 4.2 as well as IEC 60068-2-42 and/or IEC 60068-2-43;
- Test conditions used according to 4.3;
- Evaluation of each of the DUTs individually, as defined under 5.1;
- Test method/setup (only if several setups possible) and gas concentrations used during the test according to 4.3 b);
- If applicable, any other observations.