

Environmental testing —

Part 2.1: Tests —

Test Kc and guidance. Sulphur dioxide test for contacts and connections

This Part should be read in conjunction with Part 1.1 General and guidance

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the General Electrotechnical Standards Policy Committee (GEL/-) to Technical Committee GEL/15, upon which the following bodies were represented:

- Association of Manufacturers of Domestic Electrical Appliances
- British Telecommunications plc
- Directorate of Telecommunications
- EEA (The Electronics and Business Equipment Association)
- Electronic Components Industry Federation
- Ministry of Defence
- National Supervising Inspectorate
- Society of Environmental Engineers
- Society of Motor Manufacturers and Traders Limited
- Telecommunication Engineering and Manufacturing Association

The following bodies were also represented in the drafting of the standard, through subcommittees and panel:

- Biodeterioration Society
- Institute of Metals

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Foreword

This British Standard has been prepared under the direction of the General Electrotechnical Standards Policy Committee and supersedes BS 2011-2.1Kc:1977 which is withdrawn. It is related to IEC Publication 68-2-42:1976 “*Basic environmental testing procedures. Part 2: Tests — Test Kc: Sulphur dioxide test for contacts and connections*” and IEC Publication 68-2-49:1983 “*Basic environmental testing procedures. Part 2: Tests — Guidance to Test Kc: Sulphur dioxide test for contacts and connections*” published by the International Electrotechnical Commission (IEC). For ease of reproduction, the IEC text has been used for the main text of the standard.

It should be noted that the 1976 edition of IEC 68-2-42 has been withdrawn on the issue of the 1982 revision of IEC 68-2-42. This British Standard is not identical with IEC 68-2-42:1982 and/or IEC 68-2-49:1983 and should not be regarded as being other than a related standard, i.e. one whose content is short of identity or technical equivalence.

Guidance on the sulphur dioxide test for contacts and connections is given in Appendix C.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 General

This test:

- is intended to provide accelerated means to assess the corrosive effects on contacts and connections of atmospheres polluted with sulphur combustion products;
- is particularly suitable for giving information on a comparative basis;
- is not suitable as a general corrosion test, i.e. it may not predict the behaviour of contacts and connections in industrial atmospheres.

2 Object

- a) To determine the influence of atmospheres containing sulphur dioxide on the contact properties of precious metal or precious-metal-covered contacts excluding contacts consisting of silver and some of its alloys.
- b) To check wrapped or crimped connections with regard to their tightness or effectiveness.

In all tests, the major criteria of performance will be the change in contact resistance caused by exposure to the sulphur dioxide containing atmosphere.

3 Test chamber

The test chamber and its auxiliary parts shall be made of materials that do not react with or absorb sulphur dioxide and which do not influence the corrosive effects of the test atmosphere. The atmosphere shall enter and leave the chamber through tubes with sufficiently large diameters such that the total flow through the chamber is at least three, but not more than five, changes of the atmosphere per hour. The exhaust from the chamber should not be allowed to enter the laboratory.

The detailed construction of the chamber including the method of producing the test atmosphere is optional provided that:

- a) the conditions in that part of the chamber occupied by the specimens are within the specified limits;
- b) the specimens under test are protected from direct impingement of the incoming gas flow;
- c) arrangements are made to move the specimens through the test atmosphere at an average rate of 20 to 60 m per h (approx. 6 to 17 mm/s) or alternatively to gently stir the atmosphere, obtaining a similar relative velocity between atmosphere and specimen;
- d) condensation does not occur on the inside walls of the test chamber.

Examples for suitable arrangements of test apparatus are given in Appendix A and Appendix B.

4 Test atmosphere

The composition of the atmosphere within the test chamber shall satisfy the following conditions:

- sulphur dioxide (Note 1): 25 ± 5 parts per million (vol/vol).
- carbon dioxide maximum: 4 500 parts per million (vol/vol) permitted.
- temperature: 25 ± 2 °C.
- relative humidity: 75 % (Note 2).

NOTE 1 This shall be taken as the total oxides of sulphur expressed as SO₂. Small concentrations of sulphur oxides other than SO₂ (such as SO₃) are permitted to be present to a maximum concentration of 1 % of the total sulphur oxides.

NOTE 2 The relative humidity shall be held as close as possible to 75 %, but shall in no case exceed 80 % nor fall below 70 %.

The test atmosphere may be obtained by:

- a) mixing directly the necessary constituents in such a way as to ensure a homogeneous mixture (more than one stage may be necessary to obtain a homogeneous distribution of the small quantity of SO₂). An example for such a process is given in Appendix A;
- b) generating the SO₂ by a burning process and adjusting the resulting gas mixture to the specified composition. An example for such a process is given in Appendix B.

The test report shall state which of the two methods for obtaining the test atmosphere has been used.

5 Initial measurements

The specimens under test shall not be cleaned in any way unless required by the manufacturer's instructions, the relevant specification, or agreed upon between the interested parties.

The relevant specification may require that before and after the test, resistance measurements shall be carried out in combination with mechanical tests (e.g. shock or vibration tests).

The specimens shall be measured, mechanically checked and subjected to mechanical endurance as required by the relevant specification.

The contact resistance shall be measured by the low open-circuit voltage method (e.g. 1.2.4.2 of BS 9520:1983) in order to avoid damage to films formed on contact surfaces.

6 Conditioning

Prior to the commencement of the test it shall be established by suitable measurements that stable conditions for the concentration of sulphur dioxide, the temperature and the relative humidity have been achieved. Periodic checks shall be made during the test to ensure that these conditions are maintained.

Care shall be taken that the specimens are so placed that they do not come into contact with one another and that they do not shield one another from the test atmosphere.

Adequate precautions shall be taken to ensure that the contacts are not disturbed during the exposure period.

Specimens shall be exposed with contacts open and/or closed as prescribed in the relevant specification.

The loading or functioning of the specimens should be permitted when prescribed in the relevant specification.

The specimens shall be continuously exposed to the conditioning atmosphere for 4, 10 or 21 days as required by the relevant specification.

7 Final measurements

The specimens shall be removed, from the chamber and stored under standard recovery conditions for not less than 1 h and not more than 2 h before contact resistance measurements are made.

Adequate precautions shall be taken to ensure that the contacts are not disturbed. The method used for measuring the contact resistance should be the same as used for the initial measurement.

NOTE If the necessary measurements cannot be made within the specified time, the period of storage under recovery conditions may be extended to a maximum of 24 h. Such an extension shall be mentioned in the report.

In general, specimens which are exposed with contacts in the mated condition shall have their contact resistance measured before they are unmated. Specimens exposed with contacts in the unmated condition shall be mated once and the contact resistance shall then be measured.

Treatment of the contacts before final measurements are made and the details of measurements shall be as required by the relevant specification.

Visual inspection of the specimens may be called for by the relevant specification.

8 Information to be given in the relevant specification

The relevant specification shall specify the following details:

- a) measurements, checks and mechanical endurance to be made prior to the test;
- b) state of the contacts during the test, i.e. mated (closed) or unmated (open);
- c) loading or functioning of the specimens if applicable;
- d) duration of the test;
- e) measurements, checks and visual inspection to be made at the end of the test.