

Test methods for electrical materials, printed boards and other interconnection structures and assemblies —

Part 1: General test methods and methodology

The European Standard EN 61189-1:1997, with the incorporation of amendment A1:2001, has the status of a British Standard

ICS 31.180

National foreword

This British Standard is the English language version of EN 61189-1:1997, including amendment A1:2001. It is identical with IEC 61189-1:1997, including amendment A1:2001.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee EPL/52, Printed circuits, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

In implementing the European Standard as a British Standard, the IEC text on which it is based has not been changed, but for users' convenience each method has been printed on a separate sheet.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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Summary of pages

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Test methods for electrical materials, printed boards and other interconnection structures and assemblies — Part 1: General test methods and methodology

(includes amendment A1:2001)

(IEC 61189-1:1997 + A1:2001)

Méthodes d'essai pour les matériaux électriques, les cartes imprimées et autres structures d'interconnexion et les ensembles —
Partie 1: Méthodes d'essai générales et méthodologie
(inclut l'amendement A1:2001)
(CEI 61189-1:1997 + A1:2001)

Prüfverfahren für Elektromaterialien, Leiterplatten und andere Verbindungsstrukturen und Baugruppen —
Teil 1: Allgemeine Prüfverfahren und Methodik
(enthält Änderung A1:2001)
(IEC 61189-1:1997 + A1:2001)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 52/635/FDIS, future edition 1 of IEC 61189-1, prepared by IEC TC 52, Printed circuits, in cooperation with IEC TC 91, Surface mounting technology, and IEC TC 50, Environmental testing, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61189-1 on 1997-03-11.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-12-01

This part 1 of EN 61189 is to be used in conjunction with the other parts of EN 61189 and with the EN 60068 series.

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex ZA is normative and Annex A and Annex B are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61189-1:1997 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document 52/887/FDIS, future amendment 1 to IEC 61189-1:1997, prepared by IEC TC 52, Printed circuits, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 61189-1:1997 on 2001-10-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-07-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2004-10-01

Annexes designated “normative” are part of the body of the standard.

In this standard, Annex ZA is normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 1:2001 to the International Standard IEC 61189-1:1997 was approved by CENELEC as an amendment to the European Standard without any modification.

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Introduction

IEC 61189 relates to test methods for printed boards and printed board assemblies, as well as related materials or component robustness, irrespective of their method of manufacture.

The standard is divided into separate parts, covering information for the designer and the test methodology engineer or technician. Each part has a specific focus; methods are grouped according to their application and numbered sequentially as they are developed and released.

In some instances test methods developed by other TCs (e.g. TC 50) have been reproduced from existing IEC standards in order to provide the reader with a comprehensive set of test methods. When this situation occurs, it will be noted on the specific test method; if the test method is reproduced with minor revision, those paragraphs that are different are identified.

This part of IEC 61189 contains test methods for evaluating printed boards and other forms of interconnection structures. The methods are self-contained, with sufficient detail and description so as to achieve uniformity and reproducibility in the procedures and test methodologies.

The tests shown in this standard are grouped according to the following principles:

- P: preparation/conditioning methods
- V: visual test methods
- D: dimensional test methods
- C: chemical test methods
- M: mechanical test methods
- E: electrical test methods
- N: environmental test methods
- X: miscellaneous test methods

To facilitate reference to the tests, to retain consistency of presentation, and to provide for future expansion, each test is identified by a number (assigned sequentially) added to the prefix (group code) letter showing the group to which the test method belongs.

The test method numbers have no significance with respect to an eventual test sequence; that responsibility rests with the relevant specification that calls for the method being performed. The relevant specification, in most instances, also describes pass/fail criterion.

The letter and number combinations are for reference purposes, to be used by the relevant specification. Thus “3D02” represents the second dimensional test method described in this publication IEC 61189-3.

In short, in this example, 3 is the part of IEC standard (61189-3), D is the group of methods, and 02 is the test number.

A list of all test methods included in this standard, as well as those under consideration is given in Annex B. This annex will be reissued whenever new tests are introduced.

1 Scope and object

This part of IEC 61189 is a catalogue of test methods representing methodologies and procedures that can be applied to test materials used for manufacturing interconnection structures (printed boards) and assemblies.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of IEC 61189. At the time of publication, the edition indicated was valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61189 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60068-1:1988, *Environmental testing — Part 1: General and guidance*.

A1 IEC 60068-2-3:1969, *Environmental testing — Part 2: Tests — Test Ca: Damp heat, steady state*.

IEC 60068-2-30:1980, *Environmental testing — Part 2: Tests — Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*. **A1**

3 Accuracy, precision and resolution

Errors and uncertainties are inherent in all measurement processes. The information given below enables valid estimates of the amount of error and uncertainty to be taken into account.

Test data serve a number of purposes which include:

- to monitor a process;
- to enhance confidence in quality conformance;
- to arbitrate between customer and supplier.

In any of these circumstances, it is essential that confidence can be placed upon the test data in terms of:

- accuracy: calibration of the test instruments and/or system;
- precision: the repeatability and uncertainty of the measurement;
- resolution: the suitability of the test instrument and/or system.

3.1 Accuracy

The regime by which routine calibration of the test equipment is undertaken shall be clearly stated in the quality documentation of the supplier or agency conducting the test, and shall meet the requirements in ISO 9002, clause 4.11.

The calibration shall be conducted by an agency having accreditation to a national or international measurement standard institute. There should be an uninterrupted chain of calibration to a national or international standard.

Where calibration to a national or international standard is not possible, “round robin” techniques may be used, and documented, to enhance confidence in measurement accuracy.

The calibration interval shall normally be one year. Equipment consistently found to be outside acceptable limits of accuracy shall be subject to shortened calibration intervals. Equipment consistently found to be well within acceptable limits may be subject to relaxed calibration intervals.

A record of the calibration and maintenance history shall be maintained for each instrument. These records should state the uncertainty of the calibration technique (in $\pm$ % deviation) in order that uncertainties of measurement can be aggregated and determined.

A procedure shall be implemented to resolve any situation where an instrument is found to be outside calibration limits.

3.2 Precision

The uncertainty budget of any measurement technique is made up of both systematic and random uncertainties. All estimates shall be based upon a single confidence level, the minimum being 95 %.

Systematic uncertainties are usually the predominant contributor, and will include all uncertainties not subject to random fluctuation. These include:

- calibration uncertainties;
- errors due to the use of an instrument under conditions which differ from those under which it was calibrated;
- errors in the graduation of a scale of an analogue meter (scale shape error).

Random uncertainties result from numerous sources but can be deduced from repeated measurement of a standard item. Therefore, it is not necessary to isolate the individual contributions. These may include:

- random fluctuations such as those due to the variation of an influence parameter. Typically, changes in atmospheric conditions reduce the repeatability of a measurement;
- uncertainty in discrimination, such as setting a pointer to a fiducial mark, or interpolating between graduations on an analogue scale.

Aggregation of uncertainties: Geometric addition (root-sum-square) of uncertainties may be used in most cases. Interpolation error is normally added separately and may be accepted as being 20 % of the difference between the finest graduations of the scale of the instrument.