IEC 60512-1

Edition 5.0 2018-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Connectors for electrical and electronic equipment – Tests and measurements –
Part 1: Generic specification

Connecteurs pour équipements électriques et électroniques –
Essais et mesures –
Partie 1: Spécification générique

IEC 60512-1:2018-10(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – TESTS AND MEASUREMENTS –

Part 1: Generic specification

FOREWORD

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International Standard IEC 60512-1 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

This fifth edition cancels and replaces the fourth edition, published in 2001. It constitutes a technical revision.

This edition includes the following main technical changes with respect to the previous edition:

– in Clause 3, only terms relating to the testing are defined, and IEC 61076-1 is referred to for terms of connectors.
– Clause 4 (Numbering of tests and measurement specification) is added.
– Subclause 5.1.2 (Calibration) is added.
– in Clause 6 (Test), test procedure follows IEC 60068-1.

This standard shall be used in conjunction with IEC 60512-1-101 and relevant part(s) of series IEC 60512. Part 60512-1-100 provides the list of the existing test and measuring methods published within series IEC 60512.

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

FDIS	Report on voting
48B/2667/FDIS	48B/2684/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

A list of all parts in the IEC 60512 series, published under the general title *Connectors for electrical and electronic equipment – 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 "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – TESTS AND MEASUREMENTS –

Part 1: Generic specification

1 Scope

This part of IEC 60512 is intended to be used as a basis for tests and measurements specifications for electrical connectors. It provides guidance and reference for tests and measurements within the IEC 60512 series.

It includes the description and the practice of the various phases of tests and measurements (preparation, tests and measurements, requirements, documentation), in addition to basic terms and definitions applicable to any part of the IEC 60512 series.

This document is used in conjunction with IEC 60512-1-101 to establish uniform detail tests and measurements specifications.

Detail tests and measurements specifications are applicable to electrical connectors and their components (e.g. connector inserts, connector housings, locking mechanisms, contacts and terminations) within the scope of technical committee 48. They may also be used for similar devices when specified in a detail product specification.

Detail tests and measurements specifications are used in conjunction with detail product specifications which prescribe the tests to be used, the required degree of severity for each of them and the permissible performance limits. The detail product specification also specifies the deviations in procedures, which may be required when applying a test to the type of connector or its component under consideration, and it further specifies any special procedures which may be required.

NOTE RF and fibre optical connectors are not dealt with by subcommittee 48B, however, hybrid connectors which additionally employ RF and/or fibre optic contacts, are handled by SC 48B in cooperation with TC 46 and/or TC 86.

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 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60352-1:1997, *Solderless connections – Part 1: Wrapped connections – General requirements, test methods and practical guidance*

IEC 60352-2:2006, *Solderless connections – Part 2: Crimped connections – General requirements, test methods and practical guidance*
IEC 60352-2:2006/AMD1:2013

IEC 60352-3:1993, *Solderless connections – Part 3: Solderless accessible insulation displacement connections – General requirements, test methods and practical guidance*

IEC 60352-4:1994, *Solderless connections – Part 4: Solderless non-accessible insulation displacement connections – General requirements, test methods and practical guidance*
IEC 60352-4:1994/AMD1:2000

IEC 60352-5:2012, *Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance*

IEC 60352-6:1997, *Solderless connections – Part 6: Insulation piercing connections – General requirements, test methods and practical guidance*

IEC 60352-7:2002, *Solderless connections – Part 7: Spring clamp connections – General requirements, test methods and practical guidance*

IEC 60352-8:2011, *Solderless connections – Part 8: Compression mount connections – General requirements, test methods and practical guidance*

IEC 60512-1-100, *Connectors for electronic equipment – Tests and measurements – Part 1-100: General – Applicable publications*

IEC 60512-1-101, *Connectors for electronic equipment – Tests and measurements – Part 1-101:Blank detail specification*

IEC 61076-1, *Connectors for electronic equipment – Product requirements – Part 1:Generic specification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61076-1 as well as the following apply.

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

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

3.1
ambient temperature
temperature of the air in free air conditions at such a distance from the specimen that the effect of the dissipation is negligible

Note 1 to entry: In practice, the ambient temperature is taken as the average of temperatures measured at a number of points in a horizontal plane situated between 0 mm and 50 mm below the specimen at half the distance between the specimen and the wall of the chamber, or at 1 m distance from the specimen, whichever is less. Suitable precautions should be taken to avoid heat radiation affecting these measurements.

[SOURCE: IEC 60068-1: 2013, 3.9.2]

3.2
combined test
test during which a specimen is subjected simultaneously to two or more environmental influences

Note 1 to entry: Tests with simultaneous influence of a) temperature and humidity; b) temperature, humidity and specific (including chemically active) medium; and c) temperature and solar radiation are not related to combined tests.

Note 2 to entry: Combined tests, as a rule, are used to provide simultaneous climatic and mechanical influences.

Note 3 to entry: Measurements are usually taken at the start and at the end of the test.

[SOURCE: IEC 60068-1:2013, 3.14]

3.3
conditioning
exposure of a specimen to environmental conditions in order to determine the effect of such conditions on the specimen

[SOURCE: IEC 60068-1:2013, 3.3, modified: title changed to "conditioning" from original "testing".]

3.4
free air conditions
conditions within an infinite space where the movement of the air is affected only by the heat-dissipating specimen itself

3.5
lower limiting temperature
LLT
minimum temperature of a connector as defined by the climatic category assigned by the manufacturer in which a connector is intended to operate

Note 1 to entry: The LLT of a connector is covered by the climatic category as defined in IEC 60068-1, together with the ULT and the duration of the damp heat test.

[SOURCE: IEC 61984:2008, 3.16]

3.6
maximum continuous operating temperature
COT_{max}

maximum ambient temperature at which the connector can be fully (on all poles) and continuously (without interruption) loaded at its rated current, without mechanical and/or electrical deterioration, i.e. without exceeding its upper limiting temperature (ULT)

3.7
minimum continuous operating temperature
COT_{min}
minimum ambient temperature at which the connector can be still continuously operated within its ratings, without mechanical and/or electrical deterioration

3.8
pre-conditioning
treatment of a specimen with the object of removing, or partly counteracting, the effects of its previous history

Note 1 to entry: Where pre-conditioning is called for, it is the first process in the test procedure.

Note 2 to entry: Pre-conditioning may be affected by subjecting the specimen to climatic, electrical, or any other conditions required by the relevant specification in order that the properties of the specimen may be stabilized before measurement and test.

[SOURCE: IEC 60068-1:2013, 3.2]

3.9
rated current
current value assigned by the manufacturer, which the connector can carry continuously (without interruption) and simultaneously through all its contacts wired with the largest specified conductor, preferably at an ambient temperature of 40 °C, without the upper limiting temperature being exceeded

Note 1 to entry: If other ambient temperature values are used for the definition of the rated current, the manufacturer should state in the technical documentation, the ambient temperature on which the rating is based, with reference, if appropriate, to the derating curve defined in IEC 60512, test 5b.

[SOURCE IEC 61984:2008, 3.27]

3.10
rated temperature
temperature value assigned by the manufacturer, which is based on maximum continuous operating temperature (COT_{max}) and minimum continuous operating temperature (COT_{min})

3.11
rated voltage
value of voltage assigned by the manufacturer to the connector and to which operation and performance characteristics are referred

Note 1 to entry: A connector may have more than one rated voltage value.

Note 2 to entry: Rated voltage is based on clearance and creepage distance, refer IEC 60664-1.

[SOURCE: IEC 61984:2008, 3.27]

3.12
recovery
treatment of a specimen, after conditioning, in order that the properties of the specimen may be stabilized before measurement

[SOURCE: IEC 60068-1:2013, 3.4]

3.13
sequence of tests
sequence in which the specimen is exposed successively to two or more test environments

Note 1 to entry: The durations of intervals between the exposures to different test environments are such that they normally have no significant effect on the specimen.

Note 2 to entry: Pre-conditioning and recovery periods are usually performed between the different exposures.

Note 3 to entry: Measurements are usually taken before and after each exposure, the final measurement of one test being the initial measurement of the next.

[SOURCE: IEC 60068-1: 2013,3.16]

3.14
specimen
connector(s), mated set of connectors, component(s) and/or connector assembly(ies) to be tested

Note 1 to entry: The detail product specification describes what is intended as a specimen.

3.15
thermal stability
state when the temperatures of all parts of the specimen are within 3 K, or as otherwise prescribed by the relevant specification, of their final temperature

Note 1 to entry: Stability is defined as when three consecutive values of temperature raise, taken at 5 min intervals, do not differ by more than 3 K of each other.

[SOURCE: IEC 60068-1:2013, 3.11]

3.16
upper limiting temperature
ULT
maximum temperature in the connector as outcome (sum) of the ambient temperature and the temperature rise due to current flow, at which the connector is intended to be still operable

Note 1 to entry: At ambient temperature equal to ULT, the available temperature rise due to current flow is zero, thus the current carrying capacity of the connector is zero.

Note 2 to entry: The ULT of a connector is covered by the climatic category as defined in IEC 60068-1, together with the LLT and the duration of the damp heat test.

[SOURCE: IEC 61984:2008, 3.15]

4 Numbering of tests and measurements specification

The former test method standards were published in booklets, with several related tests in one document, while the present test method standards are published as individual documents.

The individual tests in the former booklets were identified by test number (e.g. test 1a, 1b, 1c etc.).

The present test method standards are assigned a specification number as IEC 60512 with two dash numbers (e.g. IEC 60512-1-1). The first dash number denotes the part which constitutes a group of tests and measurements of similar kind (see list of existing parts below). and the second dash number denotes the test within that part. The second dash number (-1,-2,-3, etc.) corresponds to alphabet (a, b, c, etc.) letter used in the former booklet-published standards, for example: IEC 60512-1-1 identifies IEC 60512, test 1a. This test number 1a corresponds to 1a of the old 60512 booklet.

The new, individual test method standards are published with numbers and titles such as the following:

IEC 60512-4-1

Connectors for electrical and electronic equipment –

Tests and measurements –

Part 4-1: Voltage stress tests – Test 4a: Voltage proof

In order to avoid confusion with numbers, the letters l (lowercase L as in Lima) and o (lowercase O as in Oscar) shall not be used.

If necessary, a further part may be added for a new test group.

The current denomination of the existing parts of IEC 60512 is as follows:

Part 1: General examination

Part 2: Electrical continuity and contact resistance tests

Part 3: Insulation tests

Part 4: Voltage stress tests

Part 5: Current-carrying capacity tests

Part 6: Dynamic stress tests

Part 7: Impact tests (free connectors)

Part 8: Static load tests (fixed connectors)

Part 9: Endurance tests

Part 10: Overload tests

Part 11: Climatic tests

Part 12: Soldering tests

Part 13: Mechanical operation tests

Part 14: Sealing tests

Part 15: Connector tests (mechanical)

Part 16: Mechanical tests on contacts and terminations

Part 17: Cable clamping tests

Part 18: Explosion hazard tests

Part 19: Chemical resistance tests

Part 20: Fire hazard tests

Part 21: RF resistance tests

Part 22: Capacitance tests

Part 23: Screening and filtering tests

Part 24: Magnetic interference tests

Part 25: Signal integrity tests

Part 26: Measurement setup, test and reference arrangement and measurements for connectors according to IEC 60603-7

Part 27: Signal integrity tests up to 500 MHz on IEC 60603-7 series connectors

Part 28: Signal integrity tests up to 1 000 MHz on IEC 60603-7 and IEC 61076-3 series connectors

Part 29: Signal integrity tests up to 500 MHz on M12 style connectors

Part 99: Test schedule for engaging and separating connectors under electrical load

5 Preparation for test (description and instructions)

5.1 Test apparatus

5.1.1 Test equipment, fixture and gauge

Details of equipment, fixture, gauge, etc., relating to the test shall be described.

5.1.2 Calibration

All test equipment shall be calibrated, at least, at the interval specified by the manufacturer or at an interval related to its intended function and use, determined by the testing laboratory.

Measurement standards used in the calibration of test equipment shall be calibrated and traceable to national standards and shall be used for calibration purposes only. The calibration (or verification) interval shall be in accordance with the manufacturer's specifications. The calibration (or verification) shall be repeated whenever the standard has been subjected to some form of abuse that may affect the fitness of a standard.

The tolerances, i.e., the calibration acceptance criteria, required for the measurement shall be considered when selecting test equipment for measurements. The precision and accuracy tolerances provided by the test equipment manufacturer for use in calibration may be accepted.

See Bibliography for detailed information related to calibration systems and measurement uncertainty.