

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Connectors for electronic equipment – Tests and measurements –
Part 16-21: Mechanical tests on contacts and terminations – Test 16u: Whisker
test via the application of external mechanical stresses**

**Connecteurs pour équipements électroniques – Essais et mesures –
Partie 16-21: Essais mécaniques des contacts et des sorties – Essai 16u: Essai
des trichites au moyen de l'application de contraintes mécaniques extérieures**



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

ICS 31.220.10

ISBN 978-2-88912-057-4

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONNECTORS FOR ELECTRONIC EQUIPMENT –
TESTS AND MEASUREMENTS –**
**Part 16-21: Mechanical tests on contacts and terminations –
Test 16u: Whisker test via the application of
external mechanical stresses**

FOREWORD

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International Standard IEC 60512-16-21 has been prepared by subcommittee 48B: Connectors, of IEC technical committee 48: Electromechanical components and mechanical structures for electronic equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
48B/2284/FDIS	48B/2294/RVD

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

A list of all parts of IEC series 60512, under the general title *Connectors for electronic equipment – Tests and measurements*, can be found on the IEC website.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

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CONNECTORS FOR ELECTRONIC EQUIPMENT – TESTS AND MEASUREMENTS –

Part 16-21: Mechanical tests on contacts and terminations Test 16u: Whisker test via the application of external mechanical stresses

1 Scope and object

This part of IEC 60512, when required by the detail specification, is used for testing connectors within the scope of IEC technical committee 48. It may also be used for similar devices when specified in a detail specification.

The object of this standard is to define a standard test method to assess the possibility of whisker growth by external mechanical stress on the tin and tin-alloy plated parts of a connector in its application (after wire termination, after soldering, after mounting, mated with counterpart).

This standard does not cover internal stress type whisker.

NOTE 1 The test method dealing with internal stress type whisker, which is caused by the formation of intermetallic compound by diffusion, or by the formation of oxide film of the plating surface, or by the difference between coefficients of thermal expansion, is specified in IEC 60068-2-82.

While for internal stress type whisker, it is possible to apply accelerated test conditions, e.g.: by damp heat or temperature cycling, for the external mechanical stress type whisker covered by this standard, due to the different whisker generation mechanism, there are no accelerated conditions. The test detailed in this standard shall then be conducted under normal ambient conditions.

NOTE 2 Physical changes during the application process may cause changes of the material qualities, so that this test cannot be used as a qualification test of a connector in 'as produced' condition.

NOTE 3 The conditions specified in this test may accelerate the growth of tin whiskers in a test specimen, but no correlation has been demonstrated between the extent of whisker growth, which may occur in this test, and the extent of whisker growth which may be expected in actual use. Whisker growth in actual use may therefore be less than or greater than the extent of whisker growth found when using this test.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-581, *International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components for electronic equipment*

IEC 60068-68-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-58: 2004, *Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*

IEC 60068-2-82:2007, *Environmental testing – Part 2-82: Tests – Test XW₁: Whisker test methods for electronic and electric components*

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

IEC 61760-1:2006, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)*

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60050-581, IEC 60512-1, IEC 60068-2-82 and the following additional terms and definitions apply.

3.1

whisker

metallic protrusion, which spontaneously grows from the surface of a plating on a base metal during storage and use

Note 1 to entry: For the purpose of this standard, whiskers have the following characteristics:

- an aspect ratio (length/width) greater than 2;
- straight, kinked, bent and twisted with a uniform cross-sectional shape.

3.2

whisker length

the straight-line distance from the point of emergence of the whisker to the most distant point on the whisker (i.e., the radius of a sphere containing the whisker with its centre located at the point of emergence.)

4 Test equipment

4.1 Optical microscope

An optical stereomicroscope with an appropriate illumination and with at least 50X magnification, capable of detecting whiskers with a minimum length of 10 µm shall be provided.

For the measurement of whisker length, the microscope shall be equipped with a scale or electronic detection system capable of length measurements with accuracy of at least ±5 µm.

4.2 Scanning electron microscope (SEM)

A SEM capable of at least 250X magnification for investigating the surface of the specimen preferably equipped with a handling system for tilting and rotating the specimen shall be provided.

5 Preparation of the specimens

5.1 General

The number of specimens shall be specified in the detail specification or in accordance with IEC 60068-2-82.

The specimens shall be directly collected from the manufacturing line.