

## **Environmental testing Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices**

Environmental testing Part 2-21: Tests - Test U:  
Robustness of terminations and integral mounting  
devices

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 60068-2-21:2006 sisaldab Euroopa standardi EN 60068-2-21:2006 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 22.09.2006 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 60068-2-21:2006 consists of the English text of the European standard EN 60068-2-21:2006.</p> <p>This document is endorsed on 22.09.2006 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b> This part of IEC 60068 is applicable to all electrical and electronic components whose terminations or integral mounting devices are liable to be submitted to stresses during normal assembly or handling operations.</p>	<p><b>Scope:</b> This part of IEC 60068 is applicable to all electrical and electronic components whose terminations or integral mounting devices are liable to be submitted to stresses during normal assembly or handling operations.</p>
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**ICS** 19.040, 31.190

**Võtmesõnad:** bending, components, components specifications writing, electricity, mechanical test, procedures, robustness of terminations, tensile, thrust, torque, torsion

English version

**Environmental testing**  
**Part 2-21: Tests -**  
**Test U: Robustness of terminations and integral mounting devices**  
(IEC 60068-2-21:2006)

Essais d'environnement  
Partie 2-21: Essais -  
Essai U: Robustesse des sorties et  
des dispositifs de montage incorporés  
(CEI 60068-2-21:2006)

Umweltprüfungen  
Teil 2-21: Prüfungen -  
Prüfung U: Widerstandsfähigkeit der  
Anschlüsse und integrierter  
Befestigungsmittel  
(IEC 60068-2-21:2006)

This European Standard was approved by CENELEC on 2006-07-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of document 91/582/FDIS, future edition 6 of IEC 60068-2-21, prepared by IEC TC 91, Electronics assembly technology, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60068-2-21 on 2006-07-01.

This European Standard supersedes EN 60068-2-21:1999.

It includes the following significant technical changes with respect to EN 60068-2-21:1999

- addition of torque severity for nominal thread diameter of 8 mm in Test Ud: torque in accordance with IEC 60252-2 (see Table 5);
- modification of substrate specification and mounting method describing lead-free solder in Test Ue (see Figure 5 and 8.3.3 et al.);
- modification of test jig and test condition in Test Ue<sub>1</sub>: substrate bending test (see Figure 7 et al.);
- change of pushing force from 10 N to 5 N in Test Ue<sub>3</sub>: shear test (see 8.5.3.2).

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) | 2007-04-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn   | (dow) | 2009-07-01 |

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 60068-2-21:2006 was approved by CENELEC as a European Standard without any modification.

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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-1 + corr. October + A1	1988 1988 1992	Environmental testing Part 1: General and guidance	EN 60068-1	1994
IEC 60068-2-20 + A2	1979 1987	Environmental testing Part 2: Tests - Test T: Soldering	HD 323.2.20 S3	1988
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)	EN 60068-2-58 + corr. December	2004 2004
IEC 60068-2-61	1991	Environmental testing Part 2: Test methods - Test Z/ABDM: Climatic sequence	EN 60068-2-61	1993
IEC 61249-2-7	2002	Materials for printed boards and other interconnecting structures Part 2-7: Reinforced base materials, clad and unclad - Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test), copper-clad	EN 61249-2-7 + corr. September	2002 2005
IEC 61188-5	Series	Printed boards and printed board assemblies - Design and use	EN 61188-5	Series
IEC 61190-1-2	2002	Attachment materials for electronic assembly Part 1-2: Requirements for solder pastes for high-quality interconnections in electronics assembly	EN 61190-1-2	2002
IEC 61191-2	1998	Printed board assemblies Part 2: Sectional specification - Requirements for surface mount soldered assemblies	EN 61191-2	1998
ISO 272	1982	Fasteners - Hexagon Products - Width across - flats		-
ISO 9453	1990	Soft solder alloys - Chemical compositions and forms	EN 29453	1993

# INTERNATIONAL STANDARD

**IEC**  
**60068-2-21**

Sixth edition  
2006-06

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## **Environmental testing –**

### **Part 2-21:**

### **Tests – Test U: Robustness of terminations and integral mounting devices**



Reference number  
IEC 60068-2-21:2006(E)

## Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

## Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

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# INTERNATIONAL STANDARD

**IEC**  
**60068-2-21**

Sixth edition  
2006-06

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## Environmental testing –

### Part 2-21:

### Tests – Test U: Robustness of terminations and integral mounting devices

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ENVIRONMENTAL TESTING –

**Part 2-21: Tests – Test U: Robustness of terminations  
and integral mounting devices**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60068-2-21 has been prepared by IEC technical committee 91: Electronics assembly technology.

This sixth edition cancels and replaces the fifth edition, published in 1999, and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition

- Addition of torque severity for nominal thread diameter of 8 mm in Test Ud: torque in accordance with IEC 60252-2 (see table 5)
- Modification of substrate specification and mounting method describing lead-free solder in Test Ue (see Figure 5 and 8.3.3 et al.)

- Modification of test jig and test condition in Test Ue<sub>1</sub>: substrate bending test (see Figure 7 et al.)
- Change of pushing force from 10 N to 5 N in Test Ue<sub>3</sub>: shear test (see 8.5.3.2)

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

FDIS	Report on voting
91/582/FDIS	91/607/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.

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

A complete list of all parts comprising the IEC 60068 series, under the general title *Environmental testing*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

A bilingual version of this publication may be issued at a later date.

## ENVIRONMENTAL TESTING –

### Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices

#### 1 Scope

This part of IEC 60068 is applicable to all electrical and electronic components whose terminations or integral mounting devices are liable to be submitted to stresses during normal assembly or handling operations.

Table 1 provides details of the applicable tests.

**Table 1 – Application**

Test	Type	Component	Mounted/not mounted
Ua <sub>1</sub>	Tensile	Leaded devices	Not mounted
Ua <sub>2</sub>	Thrust	Leaded devices	Not mounted
Ub	Bending	Leaded devices	Not mounted
Uc	Torsion	Leaded devices	Not mounted
Ud	Torque	Threaded stud or screw termination	Not mounted
Ue <sub>1</sub>	Bending	Surface mounted devices	Mounted
Ue <sub>2</sub>	Pull/push	Surface mounted devices	Mounted
Ue <sub>3</sub>	Shear	Surface mounted devices	Mounted

#### 2 Normative references

The following referenced documents are indispensable for the application 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 60068-1:1988, *Environmental testing – Part 1: General and guidance*  
Amendment 1 (1992)

IEC 60068-2-20:1979, *Environmental testing – Part 2: Tests – Test T: Soldering*  
Amendment 2 (1987)

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 60068-2-61:1991, *Environmental testing – Part 2: Tests – Test Z/ABDM: Climatic sequence*

IEC 61249-2-7:2002, *Materials for printed boards and other interconnecting structures – Part 2-7: Reinforced base materials clad and unclad – Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test), copper-clad*

IEC 61188-5 (all parts), *Printed boards and printed board assemblies – Design and use*

IEC 61190-1-2:2002, *Attachment materials for electronic assembly – Part 1-2: Requirements for soldering pastes for high quality interconnections in electronics assembly*

IEC 61191-2:1998, *Printed board assemblies – Part 2: Sectional specification – Requirements for surface mount soldered assemblies*

ISO 272:1982, *Fasteners – Hexagon products – Widths across flats*

ISO 9453:1990, *Soft solder alloys – Chemical compositions and forms*

### **3 Test $U_{a1}$ : tensile**

This test is applicable to all types of terminations.

#### **3.1 Object**

The purpose of this test is to verify that the terminations and attachment of the terminations to the body of the component will withstand such axial stresses as are likely to be applied during normal assembly or handling operations.

#### **3.2 General description**

With the termination in its normal position and the component held by its body, a force is applied to the termination in the direction of its axis and acting in a direction away from the body of the component. The force shall be applied progressively (without any shock) and then maintained for a period of  $10\text{ s} \pm 1\text{ s}$ .

#### **3.3 Preconditioning**

The method of preconditioning shall be as prescribed in the relevant specification.

#### **3.4 Initial measurements**

The specimen shall be visually inspected and electrically and mechanically checked, as required by the relevant specification.

#### **3.5 Test method**

Unless otherwise specified in the relevant specification, the test method shall be as follows:

Refer to Figure 2a.

##### **3.5.1 Application**

This test applies to all types of terminations. It shall be carried out on all the terminations, except where a component has more than three terminations, in which case the specification shall state the number of terminations per component to be tested. The test shall be carried out in such a manner that all the terminations of the component have an equal probability of being subjected to test.

##### **3.5.2 Procedure**

With the termination in its normal position and the component held by its body, a force with a value as stated in Table 2 shall be applied to the termination in the direction of its axis and acting in a direction away from the body of the component. The force shall be applied progressively (without any shock) and then maintained for a period of  $10\text{ s} \pm 1\text{ s}$ .