# IEC 60068-2-21

Edition 6.0 2006-06

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

## Essais d'environnement – Partie 2-21: Essais – Essai U: Robustesse des sorties et des dispositifs de montage incorporés

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CONTENTS

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# ENVIRONMENTAL TESTING –

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

## FOREWORD

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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 $Ue_1$: substrate bending test (see Figure 7 et al.)
– Change of pushing force from 10 N to 5 N in Test $Ue_3$: shear test (see 8.5.3.2)

This bilingual version corresponds to the monolingual English version, published in 2006-06.

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.

The French version of this standard has not been voted upon.

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- withdrawn;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.

# 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 |
|---|---|---|---|
| $Ua_1$ | Tensile | Leaded devices | Not mounted |
| $Ua_2$ | 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 |
| $Ue_1$ | Bending | Surface mounted devices | Mounted |
| $Ue_2$ | Pull/push | Surface mounted devices | Mounted |
| $Ue_3$ | 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 $Ua_1$: 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 s ± 1 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 s ± 1 s.