BS EN 60068-3-13:2016

BSI Standards Publication

Environmental testing

Part 3-13: Supporting documentation and guidance on Test T — Soldering

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National foreword

This British Standard is the UK implementation of EN 60068-3-13:2016. It is identical to IEC 60068-3-13:2016. It supersedes BS EN 60068-2-44:1995 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/501, Electronic Assembly Technology.

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

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English Version

Environmental testing - Part 3-13: Supporting documentation and guidance on Test T - Soldering (IEC 60068-3-13:2016)

Essais d'environnement - Partie 3-13: Documentation d'accompagnement et guide sur les essais T - Brasage (IEC 60068-3-13:2016)

Umweltprüfungen - Teil 3-13: Ergänzende Unterlagen und Anleitung zur Prüfung T: Löten (IEC 60068-3-13:2016)

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

The text of document 91/1345/FDIS, future edition 1 of IEC 60068-3-13, prepared by IEC/TC 91 "Electronics assembly technology" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60068-3-13:2016.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-03-17
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2019-06-17

This document supersedes EN 60068-2-44:1995.

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Endorsement notice

The text of the International Standard IEC 60068-3-13:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2 Series	NOTE	Harmonized as EN 60068-2 Series.
IEC 60749-20	NOTE	Harmonized as EN 60749-20.
IEC 61190-1-1	NOTE	Harmonized as EN 61190-1-1.
IEC 61191 Series	NOTE	Harmonized as EN 61191 Series.
IEC 61192 Series	NOTE	Harmonized as EN 61192 Series.
IEC 61760-4	NOTE	Harmonized as EN 61760-4.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 60068-2-20	2008	Environmental testing - Part 2-20: Tests - Test T: Test methods for solderability and resistance to soldering heat of devices with leads	EN 60068-2-20	2008
IEC 60068-2-58	-	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	-
IEC 60068-2-69	-	Environmental testing - Part 2: Tests - Test Te: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method	EN 60068-2-69	-
IEC 60068-2-83	-	Environmental testing - Part 2-83: Tests - Test Tf: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method using solder paste	EN 60068-2-83	-
IEC 61760-1	-	Surface mounting technology - Part 1: Standard method for the specification of surface mounting components (SMDs)	EN 61760-1	-
IEC 62137-3	-	Electronics assembly technology - Part 3: Selection guidance of environmental and endurance test methods for solder joints	EN 62137-3	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING –

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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 60068-3-13 has been prepared by IEC technical committee 91: Electronics assembly technology.

This first edition cancels and replaces IEC 60068-2-44:1995 and constitutes a technical revision.

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

– information for lead-free solders are added;
– technical update and restructuring.

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

FDIS	Report on voting
91/1345/FDIS	91/1356/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 list of all parts in the IEC 60068 series, published 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 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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ENVIRONMENTAL TESTING –

Part 3-13: Supporting documentation and guidance on Test T – Soldering

1 Scope

This part of IEC 60068 provides background information and guidance for writers and users of specifications for electric and electronic components, containing references to the test standards IEC 60068-2-20, IEC 60068-2-58, IEC 60068-2-69, IEC 60068-2-83, and to IEC 61760-1, which defines requirements to the specification of surface mounting components.

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 60068-2-20:2008, *Environmental testing – Part 2: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-58, *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 60068-2-69, *Environmental testing – Part 2-69: Tests – Test Te: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method*[1]

IEC 60068-2-83, *Environmental testing – Part 2-83: Tests – Test Tf: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method using solder paste*

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

IEC 62137-3, *Electronics assembly technology – Part 3: Selection guidance of environmental and endurance test methods for solder joints*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document the following terms and definitions apply.

3.1.1
solderability
ability of the lead, termination or electrode of a component to be wetted by solder at the temperature of the termination or electrode, which is assumed to be the lowest temperature in the soldering process within the applicable temperature range of the solder alloy

[1] A new edition (third edition) is currently under consideration.

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Note 1 to entry: The term “solderability” is often used in combination with the term “test”, indicating a specific method to evaluate the wettability or ability to be soldered of a surface under worst case conditions (soldering temperature and contact time with solder). It is not to be confused with the concepts “ability to be soldered” (see 4.1, 5.1.1) or “soldering ability” (see 3.1.4).

3.1.2
resistance to soldering heat
ability of the component to withstand the highest temperature stress in terms of temperature gradient, peak temperature and duration of the soldering process, where the temperature of the component body is within the applicable temperature range of solder alloy

3.1.3
wettability
intrinsic property of the termination material to form an alloy with the solder

Note 1 to entry: Wettability depends on the base metal used to produce the termination or, in the case of a plated termination, the condition and material used to plate the base metal.

3.1.4
soldering ability
ability of a specific combination of components to facilitate the formation of a proper solder joint

Note 1 to entry: See 3.1.3, wettability.

3.2 Abbreviations

SMD Surface mounted device

SMT Surface mounting technology

THD Through-hole mounting device

THT Through-hole mounting technology

THR Through-hole reflow soldering

4 Overview

4.1 Factors influencing the formation and reliability of solder joints (ability to be soldered)

The conditions of ease of production and the reliability of a soldered joint can be classified in three groups, as follows.

a) The joint design, determined by the choice of the two metallic elements to be joined (their shape, size, composition, etc.) and of the assembly method (relative position, initial fastening, etc.).
b) The wettability of the surfaces to be joined.
c) The conditions adopted for the soldering operation (temperature, time, flux, solder alloy, equipment, etc.).

The choice of conditions of groups a) and c) concerns the manufacturer of equipment or subassemblies, who shall know the importance of each of the conditions and the limits of their variation. Condition b) depends to a large extent on the component manufacturer, except in cases of unusual handling or storage conditions by the equipment manufacturer. The wettability of surfaces needs to be defined with whatever degree of precision is necessary to allow the equipment manufacturer to choose conditions of classes a) and c) appropriate to that wettability. On the other hand, components of satisfactory surface quality will not necessarily prevent rejectable joints arising from faults in joint design or joining conditions.

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