

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Environmental testing –**  
**Part 2-69: Tests – Test Te/Tc: Solderability testing of electronic components and printed boards by the wetting balance (force measurement) method**

**Essais d'environnement –**  
**Partie 2-69: Essais – Essai Te/Tc: Essai de brasabilité des composants électroniques et cartes imprimées par la méthode de la balance de mouillage (mesure de la force)**

<https://standards.iec.ch/Catalogue/standards/iec/e68969aa-37cf-4c19-9d1f-9acd1d867dcd/iec-60068-2-69-2017>



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**and printed boards by the wetting balance (force measurement) method**

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**électroniques et cartes imprimées par la méthode de la balance de mouillage**  
**(mesure de la force)**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING –

**Part 2-69: Tests – Test Te/Tc: Solderability testing of  
electronic components and printed boards  
by the wetting balance (force measurement) method**

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**IEC 60068-2-69 edition 3.1 contains the third edition (2017-03) [documents 91/1405/FDIS and 91/1426/RVD] and its corrigendum (2018-01), and its amendment 1 (2019-06) [documents 91/1566/FDIS and 91/1580/RVD].**

**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.**

International Standard IEC 60068-2-69 has been prepared by IEC technical committee 91: Electronics assembly technology.

This third edition constitutes a technical revision.

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

- integration of IEC 60068-2-54;
- inclusion of tests of printed boards;
- inclusion of new component types, and updating test parameters for the whole component list;
- inclusion of a new gauge R & R test protocol to ensure that the respective wetting balance equipment is correctly calibrated.

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

A list of all parts in 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 the base publication and its amendment 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,
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- replaced by a revised edition, or
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IEC 60068-2-69:2017

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## ENVIRONMENTAL TESTING –

### Part 2-69: Tests – Test Te/Tc: Solderability testing of electronic components and printed boards by the wetting balance (force measurement) method

#### 1 Scope

This part of IEC 60068 outlines test Te/Tc, the solder bath wetting balance method and the solder globule wetting balance method to determine, quantitatively, the solderability of the terminations. Data obtained by these methods are not intended to be used as absolute quantitative data for pass–fail purposes.

The procedures describe the solder bath wetting balance method and the solder globule wetting balance method. They are applicable to components and printed boards with metallic terminations and metallized solder pads.

This document provides the measurement procedures for solder alloys both with and without lead (Pb).

#### 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, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

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*

IEC 60068-2-66, *Environmental testing – Part 2: Test methods – Test Cx: Damp heat, steady state (unsaturated pressurized vapour)*

IEC 61190-1-3:2007, *Attachment materials for electronic assembly – Part 1-3: Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solders for electronic soldering applications*

IEC 61190-1-3:2007/AMD1:2010

ISO 683 (all parts), *Heat-treatable steels, alloy steels and free-cutting steels*

ISO 6362 (all parts), *Wrought aluminium and aluminium alloys – Extruded rods/bars, tubes and profiles*

#### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60068-1 and IEC 60068-2-20 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>

## 4 General description of the method

### 4.1 General

The user should note that the test method specified in this document is intended to provide consistent and discriminatory data between various test sites. Hence the choice of alloy, temperature and flux shall be controlled.

Using this test method to control a production process is encouraged. However, as each production process will employ different alloys, temperatures and fluxes, such test results shall be agreed upon between user and supplier. In case of a dispute, the procedures of this document shall prevail.

NOTE Information regarding wetting balance for SMD solderability testing is described in Annex B.

### 4.2 Components

The test specimen shall be a sample from the intended production batch. The test specimen is mounted into a suitable holder that is suspended from a sensitive balance. Liquid flux is then applied to the specimen that is brought into contact with the cleaned surface of the liquid solder within a solder bath, or the apex of a solder globule. The solder in either case is at a controlled temperature, and the lead or termination under test is immersed to the prescribed depth.

### 4.3 Printed boards

The test specimen should be a representative test specimen, a portion of the printed board being tested, or a whole board if within size limits, such that an immersion depth defined in the individual method is possible. Test specimens may be used for rigid board surface solderability and plated-through-hole solderability.

Liquid flux is then applied to the specimen that is brought into contact with the cleaned surface of a solder bath, or the apex of a solder globule, that is at a controlled temperature and immersed to the prescribed depth.

### 4.4 Measurement

The resultant forces, measured in mN, of buoyancy and surface tension acting upon the immersed termination are detected by a transducer and converted into a signal that is continuously monitored as a function of time, and recorded and displayed on a computer screen.

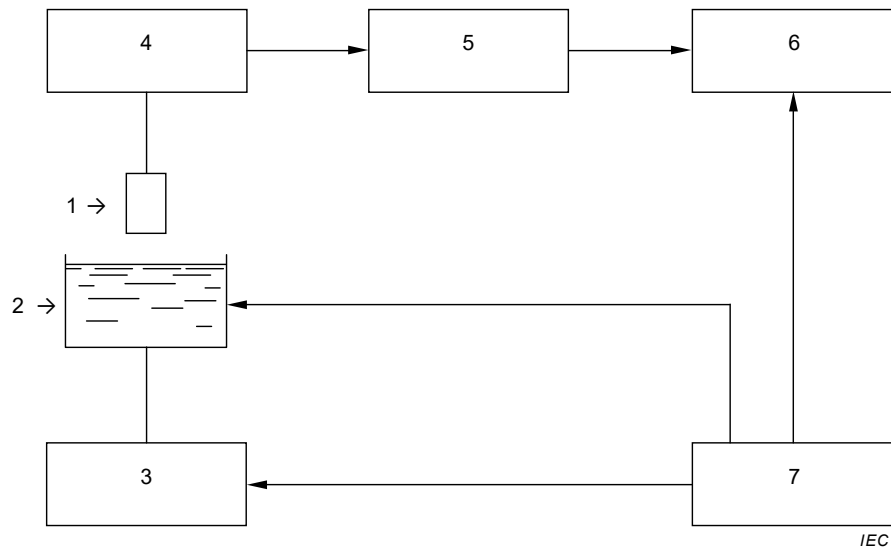
The wetting speed and the extent of wetting are derived from the force against time curve. The trace may be compared with that derived from a perfectly wetted specimen of the same nature and dimensions.

## 5 Description of the test apparatus

Figure 1 and Figure 2 show a suitable arrangement for the test apparatus.

The apparatus specifications are given in Annex A.

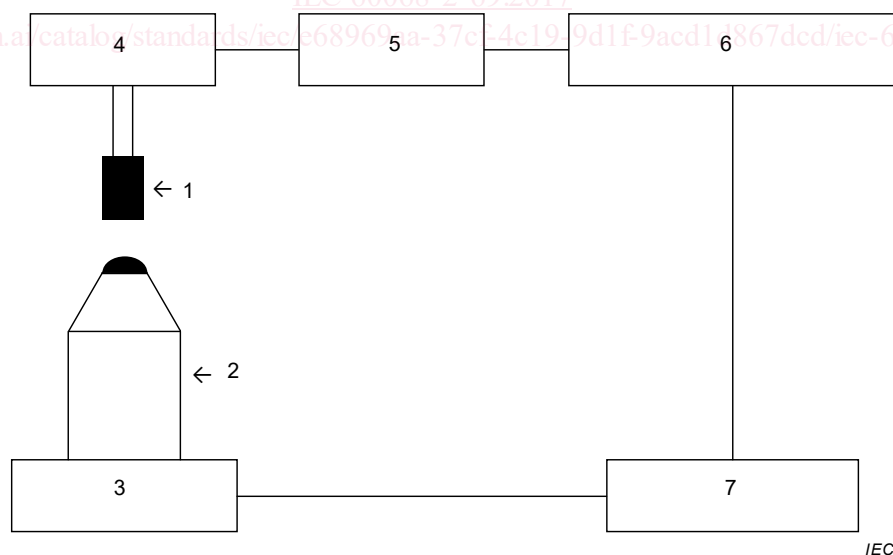
The specimen is suspended from a sensitive balance and a mechanism used to either raise the solder to meet the specimen or lower the specimen into the solder. After conditioning, the transducer signal is passed to a computer, where the force against time curve may be displayed and analysed.



**Key**

- |                                 |                          |
|---------------------------------|--------------------------|
| 1 Specimen                      | 2 Solder bath            |
| 3 Solder bath lifting mechanism | 4 Balance and transducer |
| 5 Signal conditioner            | 6 Computer               |
| 7 Control box                   |                          |

**Figure 1 – Arrangement for the test apparatus (solder bath wetting balance method)**



**Key**

- |                      |                          |
|----------------------|--------------------------|
| 1 Specimen           | 2 Globule support block  |
| 3 Lift mechanism     | 4 Balance and transducer |
| 5 Signal conditioner | 6 Computer               |
| 7 Control box        |                          |

**Figure 2 – Arrangement for the test apparatus (solder globule wetting balance method)**

## 6 Preparation of specimens

### 6.1 Cleaning

Unless otherwise specified, the specimen shall be tested in the as-received condition and care should be taken to ensure that no part of the surface to be tested becomes contaminated, particularly by contact with the fingers, during the preparation and handling of the specimen.

If required by the component specification, the specimen may be cleaned by immersion in a neutral organic solvent at room temperature. The specimen should be allowed to dry in air before testing. No other cleaning is permitted.

### 6.2 Preconditioning

If required by the component specification, the component may be subjected to preconditioning before testing. This shall be performed for 4 h at 155 °C unless otherwise agreed between user and supplier (Table 1, condition F).

In the past, it had been practice to use the term accelerated ageing which, as given in IEC 60068-2-20:2008, 4.1.1, has six alternative conditions that may be used as an alternative if agreed between user and supplier:

A – ageing 1a of IEC 60068-2-20;

B – ageing 1b of IEC 60068-2-20;

C – ageing 1b of IEC 60068-2-20, but for 8 h;

D – ageing 1b of IEC 60068-2-20, but for 16 h;

E – ageing 4 of IEC 60068-2-20;

F – ageing 3a of IEC 60068-2-20.

Refer to Table 1, for preconditioning.

IEC 60068-2-69:2017

<https://standards.iteh.ai/catalog/standards/iec-60068-2-69-2017> **Table 1 – Preconditioning** [f-9acd1d867dcd/iec-60068-2-69-2017](https://standards.iteh.ai/catalog/standards/iec-60068-2-69-2017)

Condition category	Precondition type	Exposure parameters	Use recommendation	Applicability by finish
A	Steam	1 h ± 5 min	Preferred	Non-tin and non-tin alloy containing finishes
B		4 h ± 10 min	Preferred	Non-tin and non-tin alloy containing finishes
C		8 h ± 15 min	Optional	Non-tin and non-tin alloy containing finishes
D		16 h ± 30 min	Optional	Non-tin and non-tin alloy containing finishes
E	Unsaturated pressurized vapour (120 °C, 85 % RH)	4 h ± 10 min	Preferred	All finishes
F	155 °C dry bake	4 h ± 15 min	Preferred	All finishes