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Edition 1.0 2016-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Test method for erosion of wave soldering equipment using molten lead-free solder alloy –
Part 2: Erosion test method for metal materials with surface processing

Méthode d'essai de l'érosion de l'équipement de brasage à la vague utilisant un alliage à braser sans plomb fondu –
Partie 2: Méthode d'essai d'érosion de matériaux métalliques avec traitement de surface

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TEST METHOD FOR EROSION OF WAVE SOLDERING EQUIPMENT USING MOLTEN LEAD-FREE SOLDER ALLOY –

Part 2: Erosion test method for metal materials with surface processing

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International Standard IEC 62739-2 has been prepared by IEC technical committee 91: Electronics assembly technology.

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

FDIS	Report on voting
91/1365/FDIS	91/1379/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 62739 series, published under the general title *Test method for erosion of wave soldering equipment using molten lead-free solder alloy*, 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 website 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- withdrawn,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.

TEST METHOD FOR EROSION OF WAVE SOLDERING EQUIPMENT USING MOLTEN LEAD-FREE SOLDER ALLOY –

Part 2: Erosion test method for metal materials with surface processing

1 Scope

This part of IEC 62739 provides an evaluating test method for the erosion of the metallic materials with surface processing intended to be used for lead-free wave soldering equipment as a solder bath and other components which are in contact with the molten solder. It aims at prevention of an accident or a fire by predicting a setup and life of a suitable maintenance cycle.

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 61190-1-3, *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*

3 Terms and definitions

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

3.1
erosion
phenomenon where a base material is dissolved and made thinner by coming into contact with molten solder

[SOURCE: IEC 62739-1:2013, 3.1]

3.2
lead-free solder
alloy that does not contain more than 0,1 % lead (Pb) by weight and used for joining components to substrates or for coating surfaces

[SOURCE: IEC 60194:2015, 75.1904]

3.3
dross
oxide and other contaminants that form on the surface of molten solder

[SOURCE: IEC 60194:2015, 75.0410]

4 Test

4.1 General

The specimen is mounted to the rotation block of the test equipment which is driven by the motor (may include gear unit) then immersed into molten lead-free solder and rotated to simulate solder flow in the wave soldering equipment. The erosion depth is measured after the block is rotated for a designated period of time.

4.2 Test equipment

4.2.1 Test equipment description

Test equipment shall include equipment that realises the test conditions specified in 4.4.

Component materials of the test equipment which come in contact with molten solder shall be erosion resistant or processed to be erosion resistant.

Details of the specifications of the equipment are given in Annex A.

4.2.2 Configuration example of test equipment

An example of the configuration of the test equipment is shown in Figure 1.

The test equipment consists of a pot unit, rotation unit, and control unit:

a) the pot unit consists of a heater to melt the lead-free solder alloy and a pot in which a specimen can rotate.

b) the rotation unit consists of a motor which rotates the specimen and a rotation block to which the specimen is attached.

c) the control unit has functions to control the heater, using a temperature sensor, control mechanism and motor rotation.

Since dross spreads during the test, it is preferable for the test equipment to have a ventilatory function with an exhaust air duct.

Other test equipment can be used if its configuration and functions meet the above requirements.

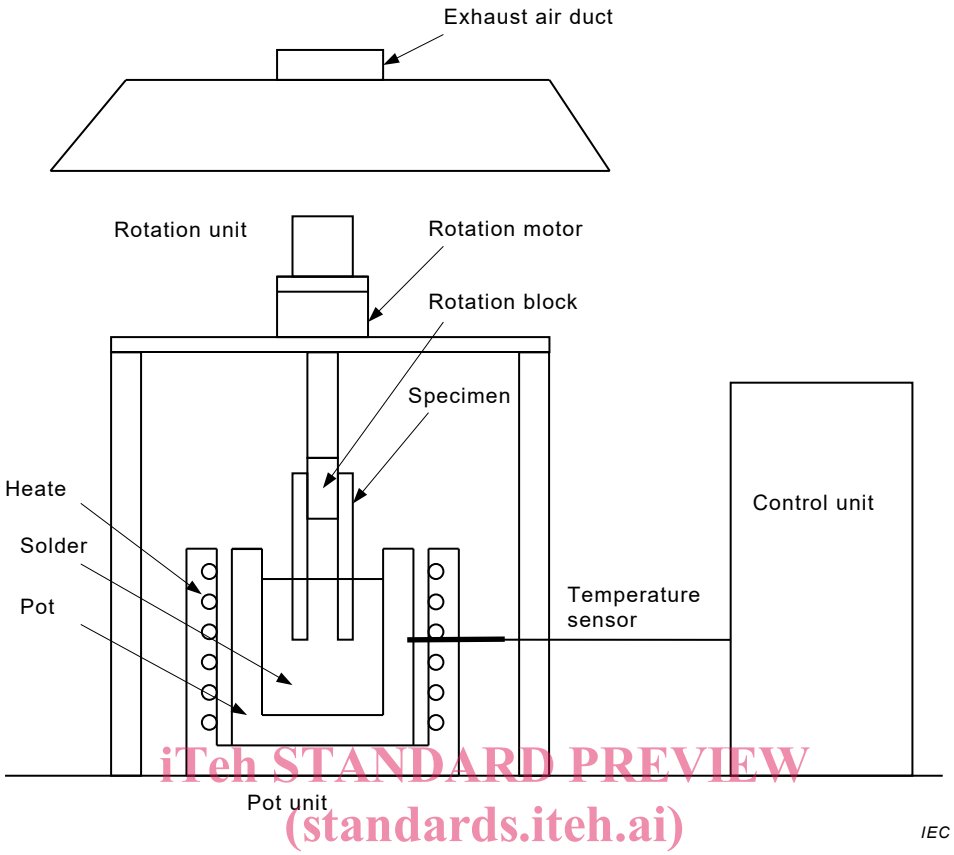


Figure 1 – Configuration example of test equipment

4.3 Specimen

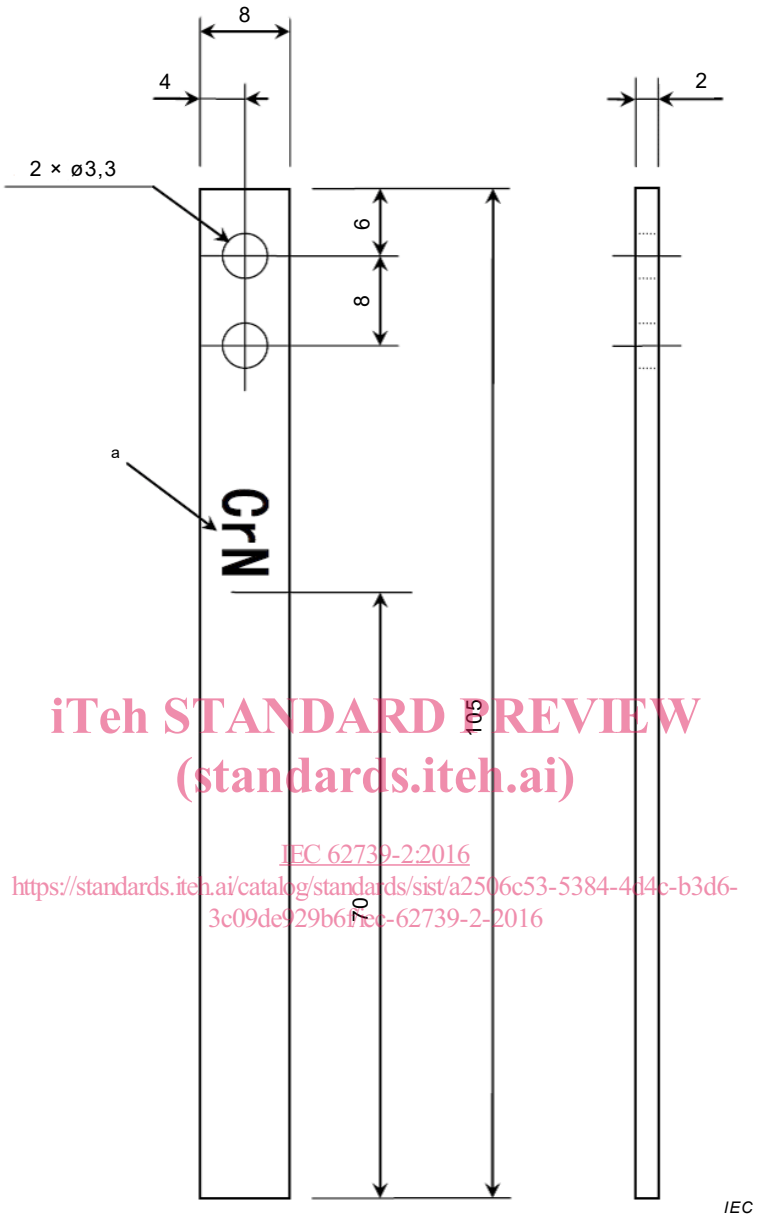
A specimen of the following material and shape is used.

a) The surface processing of the specimen shall be the same as that of the solder bath and its components which come into contact with the molten solder.

b) The shape of specimen and the indication of the surface processing designation shall be as shown in Figure 2. The indication shall be engraved.

c) The surfaces of the specimen to be evaluated shall be the surface with surface processing indication (face A) and its backside (face B), and from the lower edge to 50 mm above it.

Dimensions in millimetres



Key

[a] Engraved mark

Figure 2 – Shape of the specimen

4.4 Test conditions

Test materials and test conditions are shown in Table 1.

Table 1 – Test conditions

Composition of test solder alloy	Sn96,5Ag3Cu,5 specified in IEC 61190-1-3 shall be used if not otherwise specified in individual standards.
Solder temperature (at measurement position)	450 °C ±3 °C (the temperature is measured at a depth of 35 mm to 40 mm from the solder surface and at a distance of 20 mm to 30 mm from the specimen).
Rotation speed of specimen	100 r/min ±3 r/min.
Rotation radius of specimen	6 mm to 8 mm (from the centre of the rotation block to the outer edge of the specimen).
Dipping depth of specimen	65 mm to 70 mm (from molten solder surface to the lower edge of the specimen).
Test duration	Suitable test time needs to be set up in advance.
Frequency of removal of dross	A minimum of once every 16 h.
The time until erosion shows varies in accordance with the surface processing of the specimen. The appropriate test duration that shows the difference of the erosion depth depending on the surface processing, should be defined before performing the test. Care shall be taken to keep the uneroded area clean since this area is used as the base of the erosion measurement.	

4.5 Test methods

4.5.1 Method A – Without bending

If no further acceleration is demanded, the test without bending is conducted following the steps outlined below.

a) Clean the surface of the specimen with gauze or a paper towel.

b) The specimen shall be attached to the rotation block with face B touching the block, without contacting the molten solder.

c) Remove the dross floating on the molten solder in the pot following the dross removal procedure specified in 4.5.3. Dip the specimen attached to the rotation block into the molten solder maintained at the specified temperature. The specimen should be dipped in the molten solder to the depth specified in 4.4 and rotated by the rotation motor at the rotation speed specified in 4.4. After the rotation is complete, start measuring the elapsed time of the test. An example of a specimen attachment state without bending is shown in Figure 3.

d) Remove the specimen from the molten solder within 2 h after the test duration reaches to a specified value, and wipe off the solder completely from the specimen with a waste cloth.

e) The dross floating on the molten solder in the pot is removed at the frequency specified in 4.4.

f) After the test duration specified in 4.4, measure the depth of the erosion by the method specified in Clause 5.

g) Do not remove the specimen from the molten solder until the elapsed time of a test has reached the rated value, which includes the time for removing the dross and the equipment down time during the night.

Dimensions in millimetres

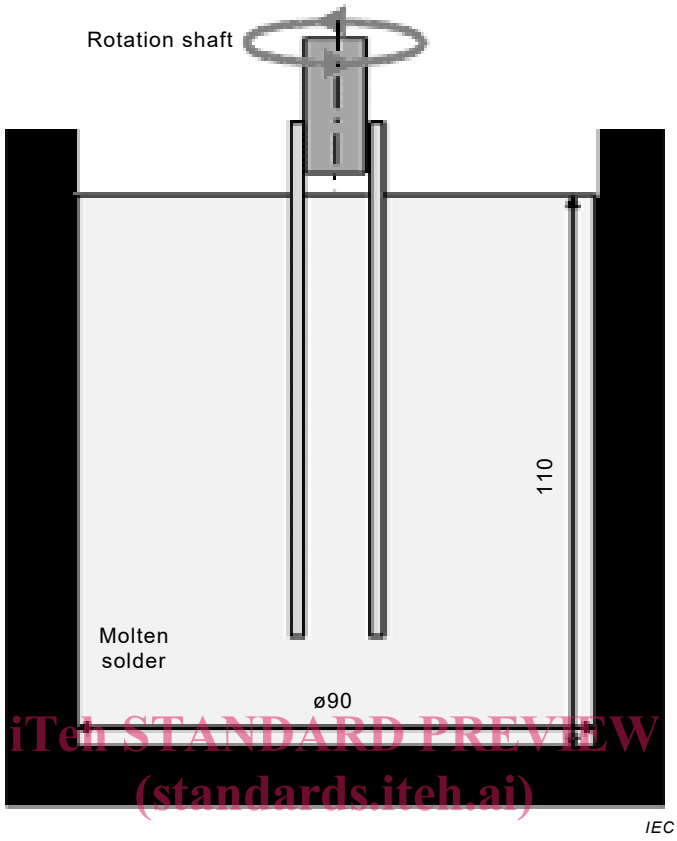


Figure 3 – Example of a specimen attachment state without bending

4.5.2 Method B – Accelerated in bended state

If further acceleration is demanded, the test with bending is conducted following the steps outlined below.

a) Clean the surface of the specimen with gauze or a paper towel.

b) The specimen shall be attached to the rotation block with face B touching the block, without contacting the molten solder.

c) Remove the dross floating on the molten solder in the pot following the dross removal procedure specified in 4.5.3. Dip the specimen attached to the rotation block into the molten solder maintained at the specified temperature. The specimen should be dipped in the molten solder to the depth specified in 4.4 and rotated by the rotation motor at the rotation speed specified in 4.4. After the rotation is complete, start measuring the elapsed time of the test. An example of a specimen attachment state with bending is shown in Figure 4.

d) Remove the specimen from the molten solder within 2 h after the test duration has reached a specified value, and wipe off the solder completely from the specimen with a waste cloth.

e) The dross floating on the molten solder in the pot is removed at the frequency specified in 4.4.

f) After the test duration specified in 4.4, measure the depth of the erosion by the method specified in Clause 5.

g) Do not remove the specimen from the molten solder until the elapsed time of a test has reached the rated value, which includes the time for removing the dross and the equipment down time during the night.