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Soft soldering fluxes — Test methods —

Part 14: Assessment of tackiness of flux residues

Flux de brasage tendre — Méthodes d'essai —

Partie 14: Détermination du pouvoir collant des résidus de flux

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 12, *Soldering materials*.

This second edition cancels and replaces the first edition (ISO 9455-14:1991), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the test report has been updated;

— this document has been editorially revised.

A list of all parts in the ISO 9455 series can be found on the ISO website.

Requests for official interpretations of any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 12 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Soft soldering fluxes — Test methods —

Part 14: Assessment of tackiness of flux residues

1 Scope

This document specifies a qualitative method for the assessment of the tackiness of the residues of a soft soldering flux after a soldering process. The method is applicable to all fluxes, solder pastes and flux cored solder wires. The method is particularly appropriate for applications where flux residues are left *in situ* on electrical and electronic equipment.

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.

ISO 197-1, *Copper and copper alloys — Terms and definitions — Part 1: Materials*

ISO 9453, *Soft solder alloys — Chemical compositions and forms*

ISO 9455-1, *Soft soldering fluxes — Test methods — Part 1: Determination of non-volatile matter, gravimetric method*

ISO 9455-2, *Soft soldering fluxes — Test methods — Part 2: Determination of non-volatile matter, ebulliometric method*

3 Terms and definitions

No terms and definitions are listed in this document.

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 Principle

The flux is melted on a copper sheet test piece in contact with a standard mass of solder. In the case of flux cored solders and solder pastes, a standard mass of the material is melted on the copper test piece. After the test piece has cooled to room temperature, the flux residues are tested for tackiness using chalk powder.

5 Reagents and materials

In the test, only reagents of recognized analytical quality and only distilled, or deionized, water shall be used.

5.1 Acid cleaning solution.

Add cautiously, with stirring, 75 ml of sulfuric acid (ρ = 1,84 g/ml) to 210 ml of water and mix. Cool, add 15 ml of nitric acid (ρ = 1,42 g/ml) and mix the solution thoroughly.

5.2 Degreasing solvent, such as acetone, 2-propanol or petroleum ether.

5.3 Powdered chalk.

5.4 0,5 mm thick copper sheet, phosphorus deoxidized sheet, according to ISO 197-1.

5.5 Acetone.

5.6 Solder wire, or pellets.

The solder used for the test and the test temperature shall be selected from one of the following:

a) Sn60Pb40, according to ISO 9453, at (235 ± 3) °C;

b) Sn96Ag3Cu0,5, according to ISO 9453, at (255 ± 3) °C;

c) any other solder or temperature combinations as agreed between the customer and the flux supplier. For test temperatures, see 8.2.

6 Apparatus

Usual laboratory apparatus and, in particular, the following.

6.1 Solder bath, either circular with diameter not less than 120 mm or rectangular with dimensions not less than 100 mm × 75 mm. The depth of the solder in the bath shall be not less than 40 mm. As a minimum, the bath temperature shall be capable of being maintained at a set temperature of the liquidus temperature of the alloy on the test plus 35 °C.

6.2 Cupping device.

This shall be fitted with a 27 mm diameter die and a 20 mm diameter ball.

6.3 Drying oven, suitable for use at (60 ± 2) °C and (110 ± 2) °C.

NOTE For liquid flux, (110 ± 2) °C is required to determine the non-volatile matter of the test flux and (60 ± 2) °C is required for 8.1.1 b).

6.4 Tongs, or other suitable mechanical device, to lift the test piece from the surface of the molten solder bath.

6.5 Soft brush, with a diameter of approximately 7 mm.

7 Test pieces

From the sheet of half hard copper, approximately 0,5 mm thick (5.4), cut each test piece 50 mm × 50 mm. Clamp each of the test pieces, in turn, centrally on to the 27 mm die of the cupping device (6.2).

Using the 20 mm diameter ball, make a depression in the centre of each test piece 3 mm deep, by forcing the ball into the die. One corner of the test piece may be bent up to facilitate handling with the tongs.

Immediately before the test, use the solvent (5.2) to degrease each test piece, and immerse the test pieces for 20 s in the acid cleaning solution (5.1).

Remove the test pieces from the cleaning solution, wash well under running water, rinse in acetone (5.5) and dry by air blowing at room temperature.

8 Procedure

8.1 Preparation of the test pieces

8.1.1 Solid, paste and liquid flux samples

Weigh 1,00 g ± 0,05 g of the solder wire or pellets (5.6), previously degreased in the solvent (5.2), and transfer it to the centre of the depression in one of the cleaned copper test pieces (see Clause 7).

NOTE 1 This may conveniently be done, if solder wire is used, by forming the wire into a tight spiral.

According to the form of the flux under test, continue with the preparation of the test piece by following the procedure given in either a) or b) as follows:

a) if the flux under test is in solid or paste form, weigh between 0,035 g and 0,040 g of the solid or paste flux and add this to the solder in the depression of the test piece;

b) if the flux under test is in liquid form, first determine its non-volatile matter content by the use of the method described in ISO 9455-1 and ISO 9455-2. Then add the appropriate volume of the liquid flux, containing between 0,035 g and 0,040 g of non-volatile matter, to the solder in the depression of the test piece. Evaporate the solvent at 60 °C for 10 min in the drying oven (6.3).

NOTE 2 If the liquid flux has low non-volatile content, it may be necessary to add the flux in two increments, carrying out the evaporation procedure after each addition.

8.1.2 Flux cored solder samples

Degrease the surface of a suitable length of the cored solder sample, using a cloth dampened with the solvent (5.2). Weigh 1,00 g ± 0,05 g of the degreased sample, form it into a small flat coil and place it in the centre of the depression in one of the cleaned copper test pieces (see Clause 7).

8.1.3 Solder paste samples

Weigh 0,50 g ± 0,05 g of the solder paste sample into the centre of the depression in one of the cleaned copper test pieces (see Clause 7).

8.2 Heating the test piece

Using the tongs (6.4) or other suitable means, carefully lower the prepared test piece from 8.1 on to the surface of the molten solder in the solder bath (6.1). The test temperature depends on the type of solder used for the test; therefore, the test temperature shall be selected from one of the following:

a) Sn60Pb40, according to ISO 9453, at (235 ±3) °C;

b) Sn96Ag3Cu0,5, according to ISO 9453, at (255 ± 3) °C;

c) any other solder as agreed between the customer and the flux supplier at (35 ± 3) °C higher than the liquidus temperature of the any other solder alloy.

Allow the test piece to float on the solder bath until the solder melts and leave the test piece in this position for a further 5 s. Remove the test piece carefully from the bath and allow it to cool, in air, in a horizontal position for 30 min.

9 Examination of the test piece

Dust the surface of the flux residue on the test piece liberally with the powdered chalk (5.3).

Lightly brush the chalked surface with the soft brush (6.5).

10 Expression of results

If the chalk powder is easily removed by brushing, the flux is deemed to be “not tacky”.

If the chalk powder cannot be removed by brushing, or can be removed only with difficulty, the flux is deemed to be “tacky”.

11 Test report

The test report shall include at least the following information:

a) the identification of the test sample;

b) the test method used (a reference to this document, i.e. ISO 9455-14);

c) results obtained;

d) any unusual features noted during the test;

e) details of any operation not included in this document, or regarded as optional;

f) the date.