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Soft soldering fluxes — Test methods —

Part 11: Solubility of flux residues

Flux de brasage tendre — Méthodes d'essai —

Partie 11: Solubilité 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 9455-11:1991), which has been technically revised.

The main changes to the previous version are:

— thickness in 5.6.2 b) has been clarified;

— alloy of the brass sheets has been clarified;

— the test procedure regarding immersion has been clarified;

— the test report has been updated;

— editorial revisions have been made.

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 11: Solubility of flux residues

1 Scope

This document specifies a qualitative method for assessing the solubility of flux residues in a selected solvent. The method is applicable to all fluxes of Type 1, as defined in ISO 9454-1.

NOTE This test gives no assurance that post-cleaning residues, which may be present in sufficiently small amounts to pass the test, will not be detrimental to the soldered assembly in the long term.

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 9454-1, *Soft soldering fluxes — Classification and requirements — Part 1: Classification, labelling and packaging*

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:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

A brass test plate is fluxed, heated to soldering temperature and, after conditioning, is immersed in the selected solvent to dissolve the flux residue. The effectiveness of the flux residue removal is indicated by the presence of a current flowing across the junction between the cleaned area and an electrical probe tip.

5 Reagents and materials

5.1 General.

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

5.2 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.

5.3 Solvent.

This is the solvent selected for the flux residue removal as recommended by the flux manufacturer or supplier.

NOTE The solvent to be used can vary with the flux composition.

5.4 Industrial methylated spirits.

5.5 Oil crayon.

5.6 Brass test plates.

5.6.1 Mechanical properties

Each test plate shall have the dimensions of 60 mm × 60 mm, cut from 0,5 mm thick brass sheet (alloy CuZn 37) with mechanical properties according to Table 1.

Table 1 — Mechanical properties for brass test plates

Temper	Thickness mm	Mechanical properties[a]					Hardness			
		Tensile strength R_m N/mm²	0,2 Proof stress $R_{p\,0,2}$ N/mm²	Elongation			Vickers HV	Rockwell[b]		
				A_5 % min.	A_{10} % min.	A_{50} % min.		F scale	B scale	Superficial 30 T
HA	0,15 to 5	350 to 420	(min. 200)	31	28	23	95 to 125	—	45 to 70	45 to 63

[a] For the relation between gauge length and thickness, see 5.6.2.

[b] The Rockwell hardness values listed are valid:

— For thickness from 0,3 mm up to and including 0,7 mm: superficial 30 T;

— For thickness over 0,5 mm: B scale.

A 3 mm deep depression shall be formed in the centre of each test plate by means of a 20 mm diameter steel ball.

5.6.2 Relation between gauge length and thickness

The elongation values given in Table 1 are valid

a) for thickness over 2,5 mm based on gauge length $5{,}65\sqrt{S_0} \triangleq A_5$;

b) for thickness from 0,10 mm up to and including 2,5 mm based on:

1) either a gauge length of $11{,}3\sqrt{S_0} \triangleq A_{10}$, or

2) a fixed gauge length of 50 mm $\triangleq A_{50}$.

The A_{50} values depend upon thickness. The given values are valid for a thickness range of 0,10 mm to 0,4 mm. The values increase slightly with increasing thickness. With a thickness equal to 2,5 mm, they are identical with those of A_{10}. For thicknesses over 2,5 mm, the A_{50} values are somewhat higher than the A_{10} values.

6 Apparatus

Usual laboratory apparatus and, in particular, the following.

6.1 Solder bath, containing not less than 4 kg of solder alloy, having a depth when molten of not less than 25 mm and capable of being maintained at a temperature of (300 ± 10) °C.

6.2 Temperature/humidity oven, capable of maintaining a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %.

6.3 Power source, 6 V direct current.

6.4 Variable resistor, 0 Ω to 100 Ω.

6.5 Milliammeter, 100 mA direct current.

6.6 Test probe, consisting of a copper rod, 4 mm diameter × 50 mm long, with a palladium/silver tip 4 mm radius, fitting into a guide sleeve of the non-conducting material (see Figure 1). The probe shall be capable of pressing freely, i.e. under its own weight, on to the surface of the brass test plate (5.6).

7 Procedure

Carry out the following procedure, in triplicate, on the flux sample.

Clean two brass test plates (5.6) by immersion for 15 s in the acid-cleaning solution (5.2). Rinse the test plates under running water, then in industrial methylated spirits (5.4) and dry with warm air flow.

Draw a 30 mm diameter circle around the depression on each test plate with the oil crayon (5.5), in order to restrict the spread of the flux during the test.

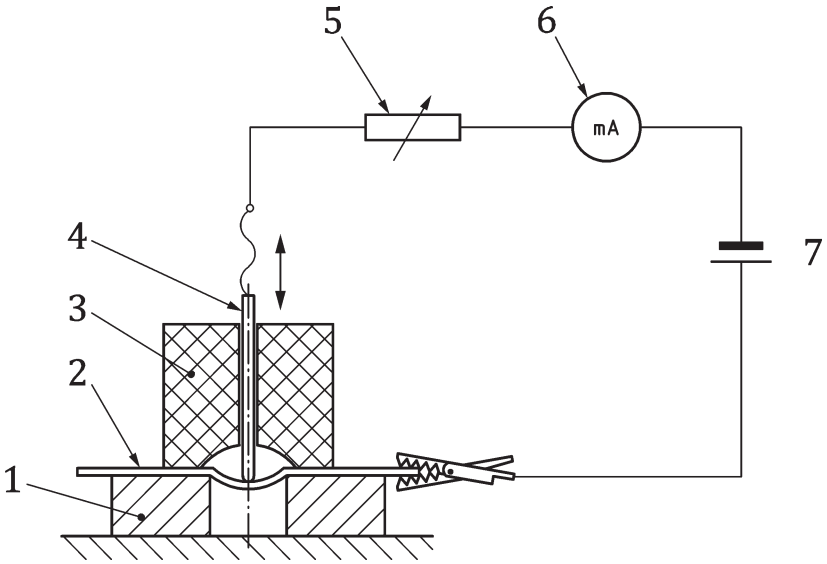
Place 0,1 ml of the liquid flux sample, or 0,05 g of the solid or paste flux sample in the depression of both test plates.

Float one of the test plates for 5 s on the surface of the solder bath (6.1), which is maintained at (300 ± 10) °C. Remove the test plate (designated “plate A”) and cool to room temperature. The other test plate (designated “plate B”), which is used as a control, is not subjected to this heating stage. Condition both the test plates in the humidity oven (6.2) at (23 ± 2) °C and (50 ± 5) % relative humidity, for 24 h.

Within 1 h after removing the test plates from the oven, immerse them in the selected solvent (5.3) for a time specified depending on the type of flux, cleaning solvent and solder paste.

Dip the test plates in clean solvent (5.3) for 2 s and then in industrial methylated spirits (5.4) for 2 s. Dry the test plates in warm air.

Condition the test plates again at (23 ± 2) °C and (50 ± 5) % relative humidity in the oven (6.2) for 24 h.



Key

1 supporting sleeve (insulating material)
2 brass test plate
3 epoxy/glass composite guide sleeve
4 copper test probe (4 mm diameter, 50 mm long with Pd-Ag tip)
5 variable resistor: 0 Ω to100 Ω
6 milliammeter: 100 mA direct current
7 power source: 6 V direct current

Figure 1 — Test apparatus for efficiency of flux residue removal

Connect the control test plate ("plate B") into the circuit, as shown in Figure 1. Place the test probe tip in the centre of the depression in the test plate, allowing it to rest under its own weight. Adjust the variable resistor to give full-scale detection on the milliammeter.

Remove the control test plate from the circuit and replace it with the other test plate ("plate A") and observe the nature of the milliammeter reading.

8 Assessment of results

If the heated and cleaned test plate ("plate A"), when connected into the circuit, gives a steady, full-scale reading on the milliammeter, then the flux residue has been efficiently removed and the flux is deemed to have passed the test using the selected solvent.

However, if an unsteady reading or a current reading less than full scale is obtained, then the flux is deemed to have failed the test using the selected solvent.

9 Test report

The test report shall include at least the following information:

a) an identification of the test sample;

b) the test method used (i.e. reference to this document, ISO 9455-11);

c) the solvent selected for the test (5.3);

d) whether the test plate was immersed in the solvent for 1 min or 10 min (see Clause 7);

e) the results obtained;

f) any unusual features noted during the test;

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

h) the date.