
**Solder wire, solid and flux cored —
Specifications and test methods —**

Part 3:

**Wetting balance test method for flux
cored solder wire efficacy**

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*Fils d'apport de brasage, pleins et à flux incorporé — Spécifications et
méthodes d'essai —*

*Partie 3: Méthode d'essai à la balance de mouillage de l'efficacité des
fils à flux incorporé*

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12224-3 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 12, *Soldering and brazing materials*.

ISO 12224 consists of the following parts, under the general title *Solder wire, solid and flux cored — Specifications and test methods*:

- Part 1: *Classification and performance requirements*
- Part 2: *Determination of flux content*
- Part 3: *Wetting balance test method for flux cored solder wire efficacy*

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Solder wire, solid and flux cored — Specifications and test methods —

Part 3: Wetting balance test method for flux cored solder wire efficacy

1 Scope

This part of ISO 12224 specifies a wetting balance test method for measuring the flux efficacy of a cored solder wire for the electronics industry. The test is applicable to all classes of flux listed in ISO 9454-1.

2 Normative references

The following referenced documents are indispensable for the application 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*

<https://standards.iteh.ai/catalog/standards/sist/2bb4ffd2-2fd9-4c3e-9e18-64550add660c/iso-12224-3-2003>

ISO 9455-16:1998, *Soft soldering fluxes — Test methods — Part 16: Flux efficacy tests, wetting balance method*

IEC 60068-2-54, *Environmental testing. Part 2: Tests. Test Ta: Soldering — Solderability testing by the wetting balance method*

3 Principle

A copper coupon and flux cored solder wire are simultaneously immersed in a bath of molten solder alloy that releases the flux to be tested by the coupon. It is subjected to a group of buoyancy forces due to Archimedian thrust and the different surface tensions at the alloy/flux/test specimen interfaces. Data are collected on wetting forces versus time which represent the meniscus, and therefore the wetting angle θ , the wetting speed and the total wetting performance, i.e. the efficacy of the flux cored solder wire.

4 Apparatus

4.1 Solder bath, containing the alloy capable of reaching test temperature (see Figure 1 and 6.3).

4.2 Wetting balance, and ancillary instrumentation, conforming to IEC 60068-2-54.

4.3 Stainless steel crucible (see Figures 1 and 2).

4.4 Additional attachments, to hold cored solder wire to be tested in accordance with the dimensions specified in Figure 3.

4.5 Copper sulfidation artificial reference (SAR) test specimens, of the following dimensions:

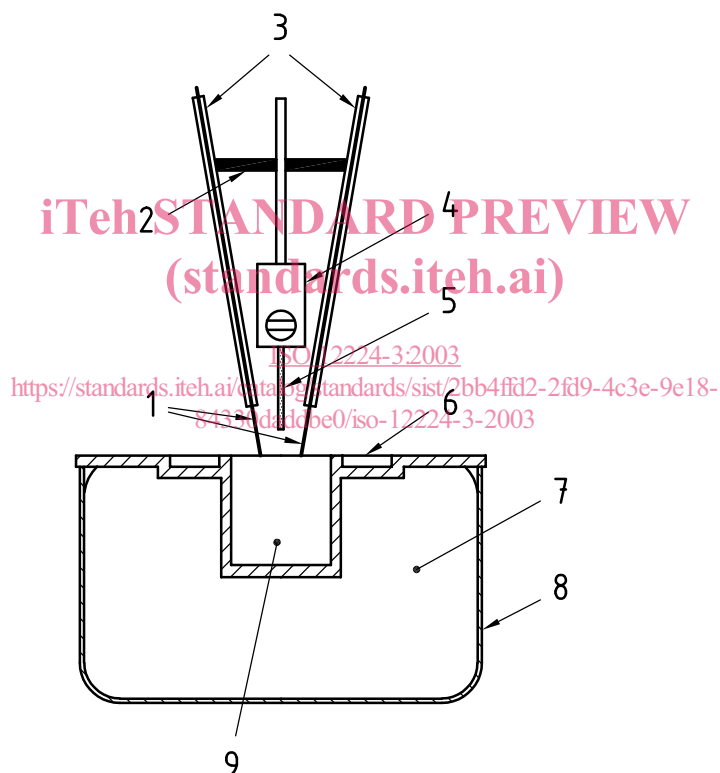
- width: $(10 \pm 0,1)$ mm for flux cored solder wire diameter ≥ 1 mm; $10 \times$ the flux cored solder wire diameter for flux cored solder wire diameter < 1 mm;
- length: constant between 15 mm and 30 mm, to suit the equipment used;
- thickness: either $0,1 \text{ mm} \pm 0,02 \text{ mm}$ or $0,3 \text{ mm} \pm 0,05 \text{ mm}$.

4.6 Absorbent paper or lint free tissue.

4.7 Non-metallic, heat-resistant scraper.

5 Reagents

5.1 Acetone or methyl ethyl ketone.

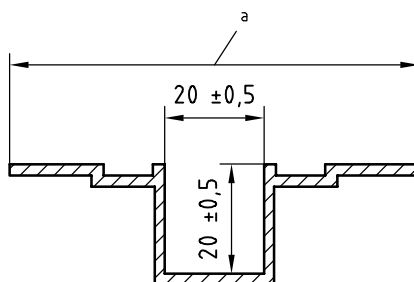


Key

- | | |
|-------------------------------------|--|
| 1 solder wire to be tested | 6 crucible |
| 2 insulation | 7 temperature controlled solder bath |
| 3 cored solder wire holder | 8 wetting balance bath |
| 4 wetting balance SAR coupon holder | 9 alloy obtained from reflowed and fluxless cored solder wire to be measured |
| 5 SAR coupon | |

Figure 1 — Apparatus for measuring wetting properties of cored solder wire

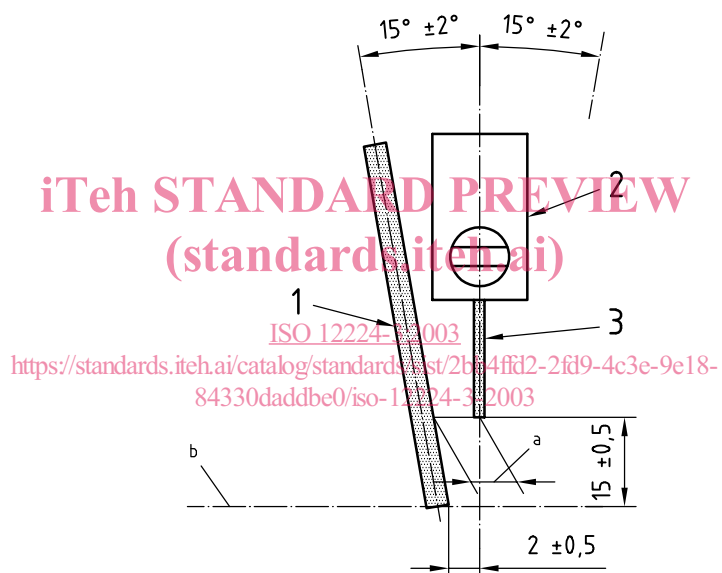
Dimensions in millimetres



^a Dimension adapted to the solder bath or the wetting balance

Figure 2 — Detail of the crucible

Dimensions in millimetres



Key

- 1 solder to be tested
- 2 SAR coupon holder
- 3 SAR coupon

^a $(\tan 15^\circ \times 22,5) \text{ mm} = 6 \text{ mm}$

^b level of the molten alloy in the crucible

Figure 3 — Relative position between the test coupon and the sample of the flux cored solder wire to be tested before the test

6 Procedure

6.1 Artificial reference sulfidation (SAR)

The controlled pollution shall be obtained in accordance with Annex B of ISO 9455-16:1998.

6.2 Calibration

The apparatus shall be calibrated in accordance with the manufacturer's instructions.

6.3 Preparation

Maintain the wetting balance (4.2) bath temperature at $50\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ above the alloy liquidus temperature of the flux cored solder wire. Put the crucible (4.3) into the properly filled solder bath (4.1) in order to maintain sufficient heat transfer to the molten alloy. Completely fill the crucible with alloy of the same composition as the flux cored solder wire to be tested. When the alloy is fully molten, adjust the level of the molten alloy to the top of the crucible and clean the surface with the scraper (4.7).

Clean at least 20 cm of each of the two samples of the flux cored solder wire with acetone or methyl ethyl ketone (5.1) on absorbent paper or lint free tissue (4.6).

Place the cleaned solder wire in the solder wire holders (4.4) as shown in Figure 3.

6.4 Measurement

Before each test, adjust the level of the molten alloy to the top of the crucible; using the non-metallic scraper (4.7), remove the dross from the top of the crucible.

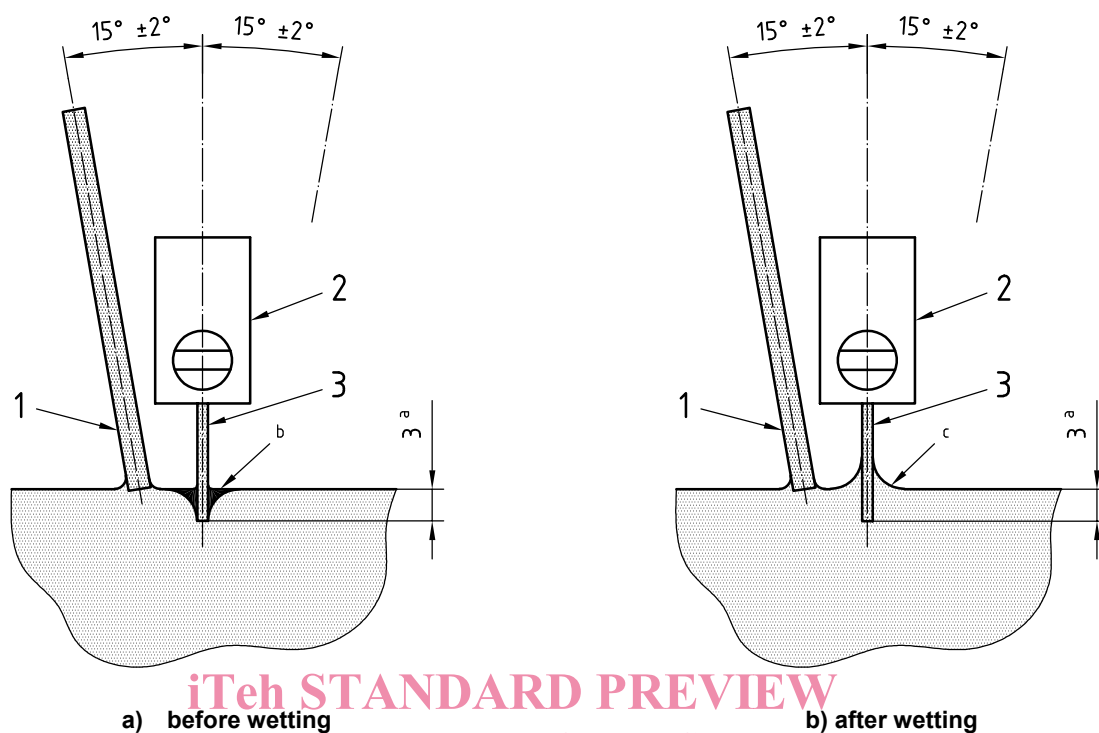
Set the two samples of the flux cored solder wire such that they are just in contact with the molten alloy in the crucible and fix them in position (see Figure 3).

Immediately following this:

- suspend the test specimen on the sensor, set the test apparatus to zero (if necessary);
- immediately start the recorder (see 4.2) and dip the SAR coupon and the two flux cored solder wire samples into the molten alloy to a depth of $3\text{ mm} \pm 0,2\text{ mm}$ at a rate of $20\text{ mm/s} \pm 5\text{ mm/s}$ (see Figure 4); run the test for a duration of $10\text{ s} \pm 1\text{ s}$;
- stop the recording operation upon withdrawal of the test specimen if stopping is not automatic.

Take ten measurements and from them obtain an arithmetic mean.

Dimensions in millimetres

**Key**

- 1 solder wire to be tested
 - 2 SAR coupon holder
 - 3 SAR coupon
- a Immersion depth.
b Condition of maximum repelling force.
c Condition of maximum wetting force.

Figure 4 — Relative positions, during the test, between the SAR coupon and the sample of the flux cored solder wire to be tested