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I.S. EN ISO 9455-10:2012

# Soft soldering fluxes - Test methods - Part 10: Flux efficacy test, solder spread method (ISO 9455-10:2012)

## I.S. EN ISO 9455-10:2012

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English Version

## Soft soldering fluxes - Test methods - Part 10: Flux efficacy test, solder spread method (ISO 9455-10:2012)

Flux de brasage tendre - Méthodes d'essai - Partie 10:  
Essai d'efficacité du flux, méthode d'étalement (ISO 9455-  
10:2012)

Flussmittel zum Weichlöten - Prüfverfahren - Teil 10:  
Bestimmung der Wirksamkeit des Flussmittels,  
Ausbreitungsprüfung (ISO 9455-10:2012)

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## **Foreword**

This document (EN ISO 9455-10:2012) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding" the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2013, and conflicting national standards shall be withdrawn at the latest by March 2013.

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**Soft soldering fluxes — Test methods —**

Part 10:

**Flux efficacy test, solder spread method**

*Flux de brasage tendre — Méthodes d'essai —*

*Partie 10: Essai d'efficacité du flux, méthode d'étalement*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 9455-10 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 12, *Soldering materials*.

ISO 9455 consists of the following parts, under the general title *Soft soldering fluxes — Test methods*:

- *Part 1: Determination of non-volatile matter, gravimetric method*
- *Part 2: Determination of non-volatile matter, ebulliometric method*
- *Part 3: Determination of acid value, potentiometric and visual titration methods*
- *Part 5: Copper mirror test*
- *Part 6: Determination and detection of halide (excluding fluoride) content*
- *Part 8: Determination of zinc content*
- *Part 9: Determination of ammonia content*
- *Part 10: Flux efficacy test, solder spread method*
- *Part 11: Solubility of flux residues*
- *Part 13: Determination of flux spattering*
- *Part 14: Assessment of tackiness of flux residues*
- *Part 15: Copper corrosion test*
- *Part 16: Flux efficacy tests, wetting balance method*
- *Part 17: Surface insulation resistance comb test and electrochemical migration test of flux residues*

Requests for official interpretations of any aspect of this part of ISO 9455 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](http://www.iso.org).

# Soft soldering fluxes — Test methods —

## Part 10:

# Flux efficacy test, solder spread method

## 1 Scope

This part of ISO 9455 specifies a method for the determination of the efficacy of a soft soldering flux. The method is known as the solder spread method of filler metal and is applicable to all flux classes defined in ISO 9454-1.

NOTE An alternative method for the determination of the flux efficacy, applicable to liquid fluxes only, known as the wetting balance method, is specified in ISO 9455-16.<sup>[3]</sup>

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

ISO 9454-1:1990, *Soft soldering fluxes — Classification and requirements — Part 1: Classification, labelling and packaging*

## 3 Symbols

$\bar{A}$	arithmetic mean spread area, in square millimetres
$H$	height of spread solder, in millimetres
$D$	diameter, in millimetres, when the solder used is considered as a sphere, $D = 1,24 \times V^{1/3}$
$R$	reproducibility
$r$	repeatability
$s_w$	standard deviation within laboratory
$s_b$	standard deviation between laboratories
$\rho$	density, in grams per millilitre, of solder under test at the test temperature
$V$	volume, in millilitres, of the solder used

## 4 Principle

A specially prepared brass test sheet is treated with a known quantity of the flux under test and a standard quantity of specified solder alloy. Upon heating, the solder alloy melts and spreads across the surface of the brass test sheet, the extent of spread being a measure of the flux efficacy. The area covered by the solder is determined by means of a planimeter or other suitable technique.

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This test method is applicable to all fluxes. If required, the efficacy of the flux sample under test can be compared with that of a standard flux (see Annex A).

**NOTE** It is possible to use copper as the test surface. However, it is preferable to use brass as the test surface in order to distinguish between various fluxes because it provides a better surface for differentiation than copper does.

**5 Reagents**

Use only reagents of recognized analytical grade and distilled or demineralized water or water of equivalent purity.

**5.1 Acid preparation solution**, prepared in a fume cupboard by cautiously mixing the following ingredients in the order given, cooling as necessary.

- 140 ml water;
- 225 ml nitric acid ( $\rho = 1,42$  g/ml);
- 600 ml sulfuric acid ( $\rho = 1,84$  g/ml);
- 5 g sodium chloride;
- 18 ml copper solution (5.2).

Thoroughly mix the solution.

This preparation solution shall be freshly prepared every day.

**WARNING — The mixture is extremely corrosive and produces hazardous fumes.**

**5.2 Copper solution**, prepared by dissolving 10 g pure copper turnings in 100 ml of 50 % by volume nitric acid solution ( $\rho = 1,42$  g/ml).

**5.3 Industrial methylated spirits.**

**5.4 Acetone.**

**6 Apparatus and materials**

**6.1 Solder bath**, containing not less than 4 kg of molten solder. The liquid solder in the bath shall be at least 25 mm in depth, with a surface area easily capable of accommodating the test specimen. As a minimum, the bath temperature shall be capable of being maintained at a set temperature of the liquidus temperature of the alloy in the test plus 35 °C. The test temperature shall be documented.

**6.2 Tongs**, or other suitable mechanical device, for lowering the brass test plate (7.1), in a horizontal plane, onto the surface of the liquid solder in the bath (6.1) and raising it again, also in a horizontal plane.

**6.3 Planimeter**, suitable for measuring surface areas of the order of 100 mm<sup>2</sup>.

**6.4 Microsyringe**, or micropipette, capable of delivering 25 µl (i.e. 0,025 ml).

**6.5 Plastic tweezers or tongs**, for use in the cleaning procedure for test plates.

**6.6 Micrometer**, as specified in ISO 3611.<sup>[2]</sup>

**6.7 Filter paper**, for use in cleaning procedure for test plates.

## 7 Test specimens

### 7.1 Brass test plates

Each plate shall be of dimensions 40 mm × 40 mm. Prepare 10 plates, of alloy CuZn37 or CuZn40, cut from brass sheet 0,5 mm thick, for each flux being tested.

NOTE 1 Annex B gives the chemical composition of these two brasses.

NOTE 2 An alternative is 10 oxidized copper test plates, each of dimensions 40 mm × 40 mm, cut from phosphorus deoxidized sheet, 0,5 mm thick, complying with ISO 197-1,<sup>[1]</sup> for each flux being tested.

NOTE 3 One corner of the test plate can be bent, to facilitate handling with the tongs (6.2).

### 7.2 Solder sample

Clean a length of solid solder wire as agreed between the contracting parties, with a diameter of 1 mm ± 0,05 mm, weighing between 0,49 g and 0,50 g with a filter paper soaked in industrial methylated spirits (5.3) or acetone (5.4). Wind the length of wire into a tight, flat spiral for use in the test. After cleaning, handle the solder wire only with clean cotton gloves.

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

- S-Sn60Pb40 (in accordance with ISO 9453) at 235 °C ± 3 °C;
- S-Sn96Ag3Cu1 (in accordance with ISO 9453) at 255 °C ± 3 °C;
- any other solder or temperature combinations as agreed between the customer and the flux supplier — for test temperatures, see 6.1.

## 8 Procedure

### 8.1 Preparation of test plates

Immediately before use, pretreat the 10 test pieces in the following manner; handle with clean tongs or with a suitable mechanical device (6.2).

Degrease the test plates (7.1) thoroughly in acetone (5.4) and allow to dry in clean air.

Immerse each test plate separately for approximately 15 s in the acid preparation solution (5.1) using the plastic tweezers or tongs (6.5). Hold the solution at a temperature between 15 °C and 25 °C.

Wash the test plates in water for a maximum of 5 s.

Repeat the acid preparation operation not more than three times, until a uniform matt lustre on the surface of the test plates has been attained.

After the final rinsing in water, rinse the test plates in methylated spirits (5.3) and dry them with filter paper (6.7).

NOTE This preparation method is applicable to both brass and copper test plates.

### 8.2 Test method

Immediately after the cleaning operation specified in 8.1, take one of the test plates and apply the flux sample under test to the central region of the plate, in accordance with a) or b):

- a) for liquid flux samples: measure 0,025 ml ± 0,001 25 ml of the flux sample by means of the microsyringe or micropipette (6.4);
- b) for paste and solid flux samples: weigh 0,025 g ± 0,001 25 g of the flux sample.

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