INTERNATIONAL STANDARD

ISO 9455-12

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Soft soldering fluxes — Test methods —

Part 12:
Steel tube corrosion test

Flux de brasage tendre — Méthodes d'essai —

Partie 12: Essai de corrosion des tubes d'acier

Reference number
ISO 9455-12:1992(E)

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.

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.

International Standard ISO 9455-12 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Sub-Committee SC 12, *Soldering and brazing 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 of halide content*

— *Part 8: Determination of zinc content*

— *Part 9: Determination of ammonia content*

— *Part 10: Flux efficacy tests, solder spread method*

— *Part 11: Solubility of flux residues*

— *Part 12: Steel tube corrosion test*

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— *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: Determination of surface insulation resistance of flux residues (Comb test)*

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Soft soldering fluxes — Test methods —

Part 12:
Steel tube corrosion test

1 Scope

This part of ISO 9455 specifies a qualitative method for assessing the corrosive properties of flux residues and flux vapours towards mild steel. The test is applicable to all fluxes, although it is primarily intended to be used for fluxes of type 1, as defined in ISO 9454-1.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9455. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9455 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 9329-1:1989, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 1: Unalloyed steels with specified room temperature properties.*

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

3 Principle

The flux under test is deposited on to the inside walls of a clean mild-steel tube. After conditioning the fluxed tube for a specified time under controlled temperature and humidity conditions, the severity of the resulting corrosion is assessed visually by comparison with a standard chart.

4 Materials

4.1 Degreasing solvent, such as acetone or petroleum ether.

4.2 Silicon carbide cloth, 180 grade.

5 Apparatus

Usual laboratory apparatus and, in particular, the following.

5.1 Copper block, as in figure 1.

The grooves, which are to accommodate the steel tubes during the test, are to be freshly tinned prior to the test. The diameter of the grooves shall be 0,5 mm larger than the diameter of the steel tubes used.

5.2 Oven, suitable for heating the copper block (5.1) to 300 °C ± 10 °C.

5.3 Laboratory thermometer, having a 0 °C to 360 °C range.

Alternatively, a thermocouple and its associated temperature indicator may be used.

5.4 Temperature/humidity oven, capable of maintaining a temperature of 23 °C ± 2 °C and a relative humidity of (80 ± 5) %.

5.5 Tweezers.

Dimensions in millimetres

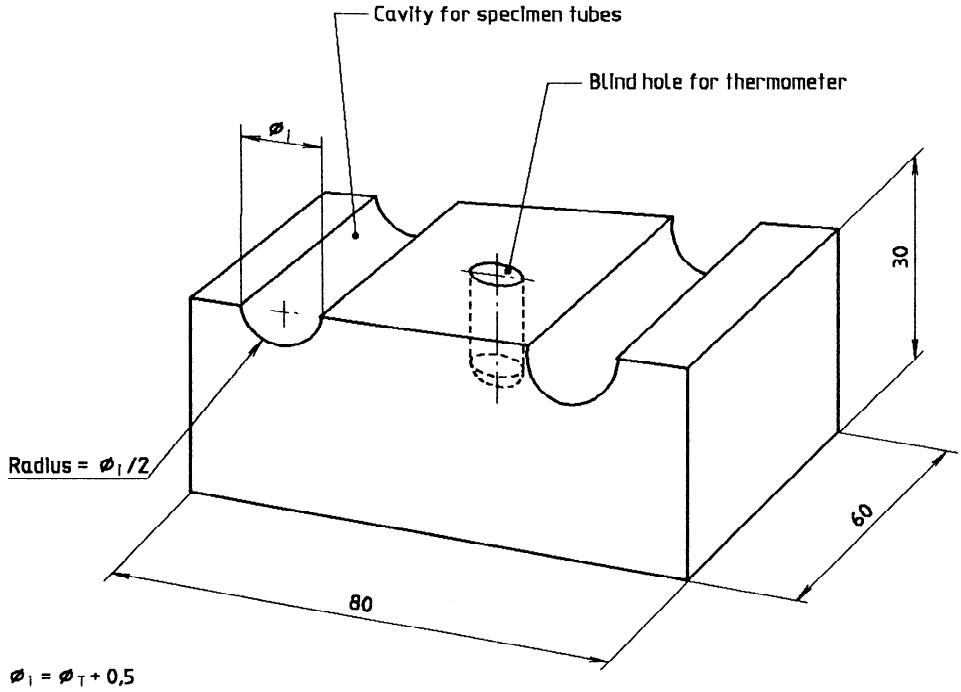


Figure 1 — Copper block

6 Procedure

6.1 Preparation of test specimens

The test specimen shall be a 60 mm ± 5 mm long steel tube of 14 mm to 16 mm diameter and 0,5 mm wall thickness.

For testing type 1 fluxes, the tube shall comply with ISO 9329-1 Grade TS 360. For testing other types of flux, the grade of steel tube to be used shall be subject to agreement between the purchaser and supplier.

Select four such specimens and cut each tube in half longitudinally. Clean the inside surfaces of the tubes with the silicon carbide cloth (4.2), so as to remove all oxidation and contamination. Degrease the cleaned tubes in the solvent (4.1). In order to avoid further contamination of the tubes, after the degreasing operation use the tweezers for subsequent handling of the tubes.

6.2 Test method

6.2.1 Apply 0,1 ml of the liquid flux under test (or 0,05 g of the flux under test if it is in solid or paste form) to the centre of the inside surface of the lower half of one of the test specimens. Place the upper half of the tube on top of the lower half.

NOTE 1 If a solvent-type flux is under test, a preliminary drying period may be specified, before the tube is placed onto the copper block, subject to agreement between the supplier and the purchaser.

6.2.2 Place the complete tube assembly into one groove of the copper block (5.1) previously heated to 300 °C ± 10 °C in the oven (5.2) and held at that temperature. Allow the test specimen to remain in the groove for 60 s. This causes the flux to evaporate and deposit onto the inside walls of the tube. Do not allow the flux or its vapours to ignite during this stage, otherwise this will invalidate the test (see also note 1).

Remove the test specimen from the block and allow it to cool.

6.2.3 Repeat the test method 6.2.1 and 6.2.2 for the second and third test specimens.

6.2.4 Use the fourth test specimen as a control for comparison purposes, by carrying out the procedure described in 6.2.2 (i.e. omitting the flux addition).

6.2.5 Separate the halves of the four cooled test specimens and transfer them to the temperature/humidity oven (5.4). Condition all the tubes for 14 days at 23 °C ± 2 °C and (80 ± 5) % relative humidity.

6.2.6 At the end of the conditioning period, remove the test specimens from the temperature/humidity oven and examine the inside (concave) surface of the upper half of each specimen for evidence of corrosion.

7 Assessment and expression of results

For the test to be valid, the surface of the "control" tube shall be comparable with the "no corrosion" specimen in figure 2. Visually assess the degree of corrosion on the inside surfaces of all the upper halves of the tubes in comparison with figure 2.

Express the result of the test as the caption of the photograph, in figure 2 which most closely approximates to the average level of corrosion of the three tubes tested.

8 Test report

The test report shall include the following information:

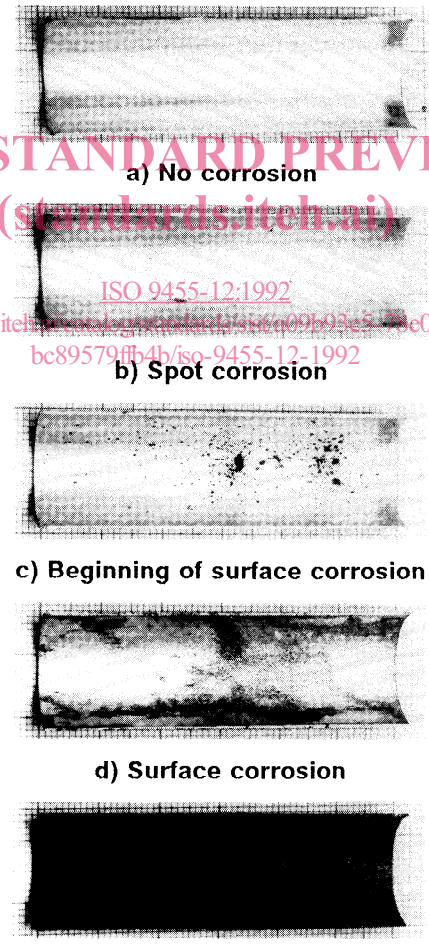
a) the identification of the test sample;

b) the test method used (i.e. reference to this part of ISO 9455);

c) the result obtained from the test (i.e. the example in figure 2 which most closely corresponds to the average level of corrosion found in the test);

d) any usual features noted in the test;

e) details of any operation not included in the part of ISO 9455 or regarded as optional.



a) No corrosion

b) Spot corrosion

c) Beginning of surface corrosion

d) Surface corrosion

e) Strong surface corrosion

Figure 2 — Levels of corrosion on inside surfaces of the upper halves of the specimen tubes

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Descriptors: soldering, soldering fluxes, tests, corrosion tests, test specimens, steel tubes.

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