BRITISH STANDARD

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14863:2005

Vitreous and porcelain enamels — Determination of the edge covering on enamelled steel plate to be used in heat exchangers

The European Standard EN 14863:2005 has the status of a British Standard

ICS 25.220.50

BSI
British Standards

National foreword

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The UK participation in its preparation was entrusted to Technical Committee STI/36, Vitreous enamel coatings, which has the responsibility to:

— aid enquirers to understand the text;

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Summary of pages

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 14863

December 2005

ICS 25.220.50

English Version

Vitreous and porcelain enamels - Determination of the edge covering on enamelled steel plate to be used in heat exchangers

Émaux vitrifiés - Détermination du revêtement de l'arête sur une plaque en acier émaillé destinée aux échangeurs de chaleur

Emails und Emaillierungen - Bestimmung der Kantenabdeckung von emaillierten Stahlblechen für Wärmeaustauscher

This European Standard was approved by CEN on 4 November 2005.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Contents

Page

Foreword

This European Standard (EN 14863:2005) has been prepared by Technical Committee CEN/TC 262 “Metallic and other inorganic coatings”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by June 2006, and conflicting national standards shall be withdrawn at the latest by June 2006.

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1 Scope

This European Standard specifies a test method for the determination of the covering of the edge of enamelled steel plate to be used in heat exchangers. This method is applicable to all enamelling processes.

It is applicable to plates with a thickness between 0,5 mm and 1,5 mm.

This method is not applicable where the current flow generated in the test exceeds 3 A.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 3696, *Water for analytical laboratory use — Specification and test methods (ISO 3693:1987)*

3 Principle

The edge of an enamelled steel plate to be tested is submerged in a fluid electrolyte. An alternating current source and a stabilized voltage are connected to the plate. The recorded current is a measure of the covering at the edge.

4 Reagents and materials

During the analysis, unless otherwise stated, use only reagents of recognized analytical grade and distilled or de-mineralized water or water of equivalent.

4.1 Pickling fluid, consisting of sulfuric acid (H_2SO_4) solution, (7 ± 0,5) % by mass, with an Fe^{2+} concentration of (2 ± 1,5) g/l, at a temperature of (60 ± 2) °C.

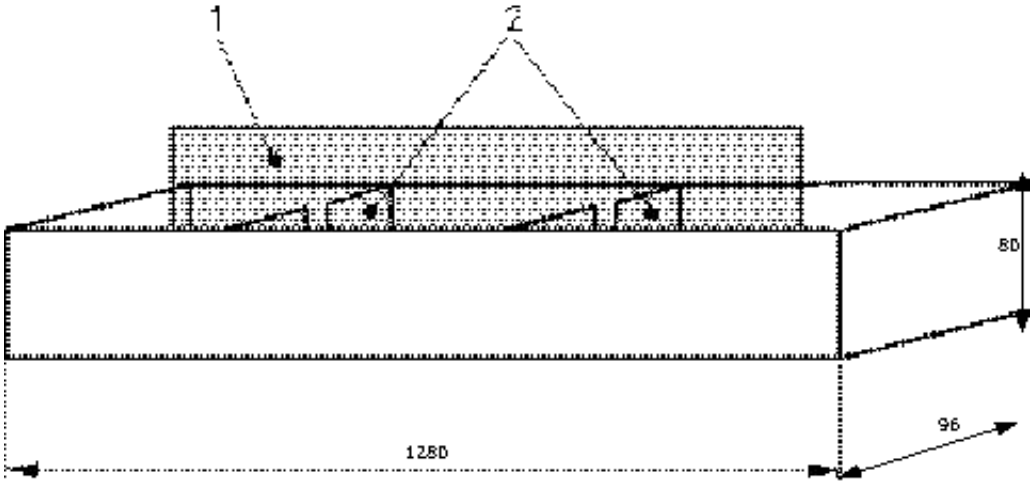
4.2 Test bath electrolyte, consisting of sodium chloride solution, 5 % NaCl by mass, made with distilled water conforming to grade 3 of EN ISO 3696, at a temperature of (22 ± 3) °C.

5 Apparatus

5.1 Test bath, consisting of a polypropylene container holding electrolyte solution in which the electrodes and a test plate are placed. Polypropylene plates are used for centring and holding the test plate 10 mm from the bottom of the bath.

The arrangement of the bath and the dimensions of the components are shown in Figures 1, 2 and 3.

Dimensions in millimetres



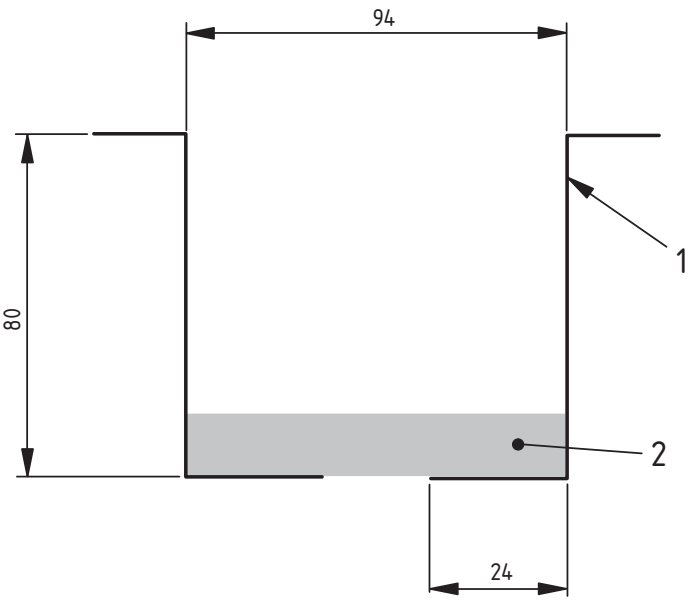
Key

1 Plate to be tested

2 Plates for centring and lifting the test plate from the bottom.

Figure 1 — Dimensions of the test bath

Dimensions in millimetres



Key

1 Electrodes (1264 mm long)

2 NaCl solution

Figure 2 — Dimensions of the two stainless steel electrodes (EN 10088-1 grade 1.4301)

Dimensions in millimetres

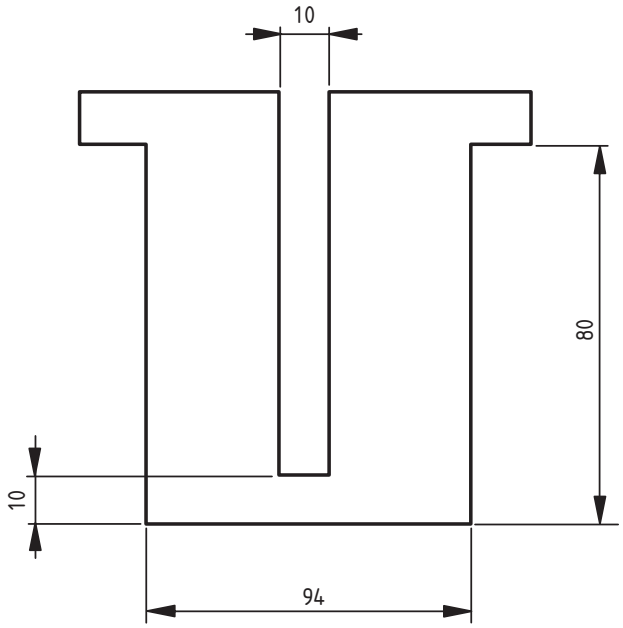


Figure 3 — Dimensions of the two polypropylene centring plates

5.2 Voltage source, consisting of a stabilized alternating source of (10,0± 0,05) V. The electrical diagram is shown in Figure 4.

NOTE This voltage source should be able to maintain these voltage limits throughout the test.

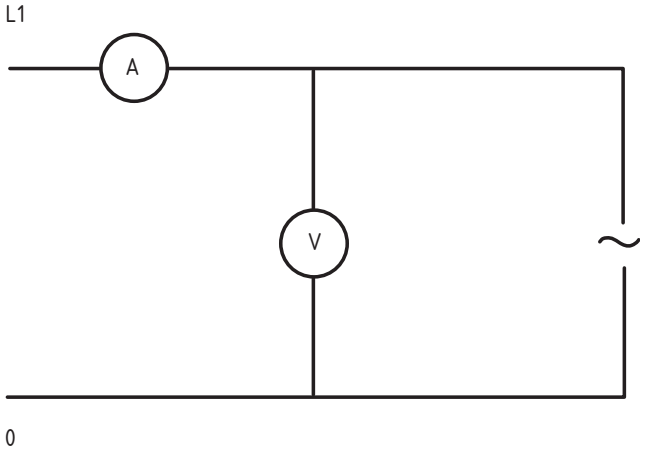


Figure 4 — Electrical diagram

5.3 Ammeter, capable of reading to the nearest 0,01 A.

6 Test specimens

Select at least one pair of plates, one corrugated and one undulated, of the same length. The minimum length of the edge to be used for the test is 300 mm.

Immerse the plates in the pickling solution (4.1) in a suitable container for a period of 10 min ± 10 s. Rinse the plates well with water and dry them.

7 Procedure

Using the design drawing, determine to the nearest 1 mm the total or stretched edge length of the corrugated or undulated test specimen.

NOTE The stretched edge length is the length taking into account the profiling of the corrugation and undulation of the test specimen.

Determine the un-enamelled thickness of the test specimen to the nearest 0,1 mm.

Position a plate in the bath (5.1) in such a way that a maximum of 10 mm of the edge to be measured (one of the edges in the flue gas direction) is immersed in the electrolyte solution (4.2). Do this within one hour after rinsing off the sulfuric acid.

Connect the voltage source (5.2) between the bath electrodes and electrode L1 to the test specimen and, using the ammeter (5.3), record the current automatically (3 ± 0,5) s after switching on the test voltage.

Repeat the test for the other edge of the test specimen and for the second test specimen.

8 Calculation and expression of results

For each edge, calculate the uncoated surface area, a in mm^2, using the equation:

$$a = 1{,}222 \cdot I^2 + 12{,}903 \cdot I \quad (1)$$

where

I is the measured current in A.

Calculate the percentage free surface area S using the equation:

$$S = \frac{a}{b \times c} 100 \quad (2)$$

where

a is the uncoated surface area in mm^2, calculated from Equation (1);

b is the stretched edge length plate in mm;

c is the thickness of the un-enamelled plate in mm.

Calculate the percentage edge covering, E, using the equation:

$$E = 100 - S \quad (3)$$

Express the percentage edge covering as the mean of all determinations, rounded to the nearest 0,1 %, reporting the results of all determinations.

Calculate the uncoated surface area U, in mm^2/m, using the equation:

$$U = \frac{a}{b}1000 \quad (4)$$

Express the uncoated surface area per metre length, as the mean of all determinations, rounded to the nearest 10 mm^2/m.

9 Accuracy

The accuracy of this measurement is ± 0,3 % of the calculated percentage edge covering and ± 2 mm^2/m of the uncoated surface area.

10 Test report

The test report shall include the following information:

a) all information necessary for identification of the sample tested;

b) reference to this European Standard, i.e. EN 14863:2005;

c) results of the test calculated as described in Clause 8, expressed as:

— mean percentage edge covering, rounded to the nearest 0,1 %;

— mean uncoated surface area per metre length, rounded to the nearest 10 mm^2/m;

including the results of the individual determinations the thickness of the un-enamelled plate.

d) any deviations from the procedure specified;

e) any unusual features (anomalies) observed during the test;

f) date of the test.

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