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Vitreous and porcelain enamels — Enamelled articles for service under highly corrosive conditions — High voltage test

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FOREWORD

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Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

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It has been approved by the Member Bodies of the following countries :

Australia	Israel	Romania
Egypt, Arab Rep. of	Italy	South Africa, Rep. of
France	Japan	Sweden
Germany	Netherlands	Switzerland
Hungary	New Zealand	Turkey
India	Poland	United Kingdom
Ireland	Portugal	U.S.S.R.

No Member Body expressed disapproval of the document.

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Vitreous and porcelain enamels — Enamelled articles for service under highly corrosive conditions — High voltage test

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method of test for vitreous and porcelain enamelled articles using high voltage.

The purpose of the high voltage test is to detect and locate defects which extend down to the metal base, and weak spots in the enamel layer.

2 DEFINITION

For the purposes of this International Standard, the following definition applies :

weak spots : Those areas of the enamel layer where its thickness falls below the required value determined by the application of high voltage, because of blisters, foreign body inclusions, spalling or cracks.

3 PRINCIPLE

High voltage testing is carried out with an agreed d.c. voltage above 2 kV by passing a positive electrode over the enamel surface; the high voltage generator indicates defects and weak spots by a spark discharge and a simultaneous optical and/or acoustic signal.

4 APPARATUS

4.1 High voltage generator to deliver a d.c. voltage above 2 kV corresponding to the testing voltage (see 6.1) and adjustable with the tolerances + 5 %, − 10 %.

The total internal resistance shall be high enough to give the short circuit current of the generator an arithmetical mean from 2 to 3 mA maximum. The peak value of the current during a spark discharge must be between 10 and 50 mA maximum and amount of charge per impulse may be 25 μC maximum.

The negative pole of the generator shall be earthed and the positive pole shall be connected to the test electrode by a screened high voltage cable of suitable length.

4.2 Test electrode

The test electrode consists of an insulated hand-piece and a brush holder made of metal wire for the test brush. The latter shall be constructed in such a way that it is completely unaffected by the spark discharge and shall be able to cover as large an area as possible when sweeping the enamel surface. The hand-piece shall be provided externally with an earthed metal cover.

A protective resistor shall be arranged between the hand-piece and the test brush to limit the peak current value (10 to 50 mA maximum) during the electric spark discharge. This resistor shall be constructed in such a way that tracking due to deposits of dirt reducing its value or the formation of an arc during the operation is not possible.

4.3 Voltage control and indication of defects and weak areas

The test voltage shall be measured accurately to + 5 %, − 10 % directly behind the protective resistor of the hand-piece.

A device shall be provided which will give a clear optical and/or acoustic signal at each spark discharge.

5 SPECIMENS

The specimens can be commercial items, part thereof or test pieces specially prepared.

No special preparation of specimens is required.

6 PROCEDURE

6.1 Apply the test voltage by taking into account the end-use of the enamelled article, bearing in mind the dielectric strength and layer thickness of the enamel (for an example see the figure in the annex). It shall amount to at least 1,5 times the breakdown voltage for a layer of air of the same thickness.

NOTE — The breakdown voltage of 1 mm air line between point and ball is approximately 1 kV.

6.2 The surface of the enamel layer under test shall be dry and free from impurities. The enamel layer shall have a temperature of 30 °C maximum. The metallic base material shall be earthed.

6.3 Switch on the current, adjust the voltage to the test requirement and move the test brush covering an area as large as possible over the enamel surface at a speed of 40 cm/s maximum, controlling the voltage accordingly. If the voltage at the brush falls by more than 10 % without a spark discharge occurring, investigate and remove the cause (see 6.2).

Defects and weak spots are indicated by a visible spark and simultaneously by an optical and/or acoustic signal. Wherever a spark discharge occurs on the enamel surface it means a contact point and indicates the position of a defect or weak spot.

7 TEST REPORT

The test report shall include the following particulars :

a) test voltage;

b) number and position of contact points;

c) thickness of the enamel layer where a defect (or defects) occurs.

ANNEX

BREAKDOWN VOLTAGE OF A SPECIAL ENAMEL, AS A FUNCTION OF LAYER THICKNESS AND TEMPERATURE, MEASURED WITH A SPHERICAL ELECTRODE