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

*Émaux vitrifiés — Articles émaillés pour usage dans des conditions
hautement corrosives — Essai sous haute tension*



Foreword

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International Standard ISO 2746 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 6, *Vitreous and porcelain enamels*.

This second edition cancels and replaces the first edition (ISO 2746:1973), which has been technically revised.

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

1 Scope

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

This high voltage test is used to detect defects in enamel coatings that extend down to the metal base, and to locate weak spots in enamel coatings.

This test method applies to voltages not less than 2 kV and a coating thickness not less than 660 μm .

2 Definition

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

2.1 weak spot: Area of an enamel coating where the coating thickness as determined by the application of high voltage falls below the required value due to the presence of blisters, foreign body inclusions, spalling or cracks.

3 Principle

The high voltage test is carried out at a direct current (d.c.) voltage of greater than 2 kV by passing a positive electrode over the enamel surface; the high voltage generator locates defects and weak spots as a spark discharge and a simultaneous optical and/or acoustic signal.

4 Apparatus

4.1 High voltage generator, capable of delivering a d.c. voltage of greater than 2 kV corresponding to the test voltage (see 6.1). It shall be capable of providing adjustable and measurable voltages to within $\pm 5\%$.

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

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

4.2 Test electrode, with the following attachments:

4.2.1 Insulated hand-piece, provided externally with an earthed metal cover.

4.2.2 Brush holder, of metal wire (used for the test brush), constructed such that it is completely unaffected by the spark discharge and covers as large an area as possible when sweeping the enamel surface.

4.2.3 Protective resistor, placed between the hand-piece and the test brush to limit the peak current value (10 mA to 50 mA maximum) during the electric spark discharge. It shall be designed such that dangerous reduction of this protective effect, for instance caused by contamination, or the formation of an arc be avoided during operation.

4.3 Device, capable of giving a clear optical and/or acoustic signal at each spark discharge.

5 Test specimens and sampling

NOTE — The test specimens can be commercial items. No special preparation of test specimens is required.

The number of test specimens and the sampling plan shall be agreed between the interested parties.

6 Procedure

6.1 Apply the test voltage taking into account the end-use of the enamelled article and the dielectric strength and coating thickness of the enamel. Ensure that the applied test voltage is at least three times the breakdown voltage for a layer of air of the same thickness.

NOTES

1 — The coating thickness of the enamel can be estimated using the test methods given in ISO 2178 or ISO 2360.

2 — For the interelectrode gap of 1 mm the breakdown voltage in air between the electrodes is approximately 1 kV for the case where one electrode is tipped and the other electrode is spheroidized.

6.2 Ensure that

- a) the surface of the enamel coating under test is dry and free from impurities;
- b) the enamel coating has a temperature that is above the dewpoint and does not exceed 30 °C;
- c) the metallic base material is earthed.

6.3 Switch on the current, adjust the voltage to the test requirement and move the test brush to cover as large an area 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).

Note the positions of any defects or weak spots indicated by a spark discharge on the enamel surface, and measure the thickness of the enamel coating at those points.

7 Test report

The test report shall include the following information:

- a) reference to this International Standard, i. e. "determined in accordance with ISO 2746 : 1998";
- b) the number of test specimens and the sampling plan used;
- c) the test voltage;
- d) the number and the position of contact points;
- e) the thickness of the enamel coating where a defect (or defects) occurs.

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Annex A
(informative)

Bibliography

- [1] ISO 2178:1982, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method.*
- [2] ISO 2360:1982, *Non-conductive coatings on non-magnetic basis metals — Measurement of coating thickness — Eddy current method.*

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