
International Standard



2743

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Vitreous and porcelain enamels — Determination of resistance to condensing hydrochloric acid vapour

Émaux vitrifiés — Détermination de la résistance aux vapeurs de condensation de l'acide chlorhydrique

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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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 2743 was prepared by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*.

This second edition cancels and replaces the first edition (ISO 2743-1973), sub-clause 5.1 and clauses 7 to 9 of which have been technically revised.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Vitreous and porcelain enamels — Determination of resistance to condensing hydrochloric acid vapour

1 Scope and field of application

This International Standard specifies a method of test for determining the resistance of flat surfaces of vitreous and porcelain enamels of containers and chemical equipment to condensing azeotropic hydrochloric acid vapour.

2 References

ISO 2723, *Vitreous and porcelain enamels for sheet steel — Production of specimens for testing.*

ISO 2724, *Vitreous and porcelain enamels for cast iron — Production of specimens for testing.*

ISO 2733, *Vitreous and porcelain enamels — Apparatus for testing with acid and neutral liquids and their vapours.*

ISO 3585, *Glass plant, pipeline and fittings — Properties of borosilicate glass 3.3.*

ISO 4788, *Laboratory glassware — Graduated measuring cylinders.*

3 Principle

Exposure of an enamelled test specimen to attack by the vapour of a boiling 20 % (*m/m*) solution of hydrochloric acid for 168 h (7 days) or 336 h (14 days), the test specimen being placed in the vapour chamber of the testing apparatus.

Determination of the loss in mass and calculation of the corrosion rate therefrom.

NOTE — The lower the corrosion rate, the higher is the resistance of the vitreous and porcelain enamel to the boiling hydrochloric acid vapour.

4 Reagents

During the determination, use only reagents of recognized analytical grade and only distilled water, or water of equivalent purity.

Hydrochloric acid, 20 % (*m/m*) solution, $\rho = 1,098$ g/ml.

A fresh solution is required for each test.

5 Apparatus

5.1 Testing apparatus and packing A, complying with ISO 2733.

The bottom of the testing apparatus shall comprise a plate made either of borosilicate glass 3.3 complying with ISO 3585, or of tantalum. Alternatively, an enamelled plate, for example another specimen having a diameter of 105 mm, may be used.

5.2 Drying oven, capable of maintaining temperatures of at least 130 °C.

5.3 Desiccator, for example with an internal diameter of 200 mm.

5.4 Graduated measuring cylinder, capacity 500 ml, complying with the requirements of ISO 4788.

5.5 Beakers.

5.6 Balance, accurate to $0,2 \times 10^{-3}$ g.

5.7 Sponge, soft.

6 Test specimens

6.1 Prepare the test specimens in accordance with the International Standards for the appropriate basis metal.

NOTE — The production of the test specimens for testing vitreous and porcelain enamels for sheet steel and for cast iron is specified in ISO 2723 and ISO 2724, respectively.

6.2 Rinse each test specimen with water and dry it for 2 h in the drying oven (5.2) maintained at 110 ± 5 °C. Then allow it to stand for at least 2 h in the desiccator (5.3) and finally weigh it to the nearest $0,2 \times 10^{-3}$ g (starting mass).

7 Procedure

7.1 Carry out duplicate determinations.

7.2 Fix the test specimen in the testing apparatus (5.1) so that it forms the top of the cylinder with the coated side of the test specimen facing the interior of the cylinder.

Fix the glass, tantalum or enamelled plate (see 5.1) so that it forms the bottom of the cylinder.

Screw down the three wing-nuts evenly to ensure that the testing apparatus is watertight.

7.3 Run 450 ml of the hydrochloric acid solution (clause 4) into the testing apparatus through the socket for the reflux condenser, replace the latter and switch on the heater.

As soon as the solution is boiling vigorously, adjust its rate of boiling by means of the heat-control device so that the condensate discharges from the condenser at the rate of 30 to 50 drops per minute.

Record the temperature of the hydrochloric acid vapour during boiling.

7.4 The duration of boiling shall be 168 h (7 days). If the loss in mass of the test specimen after this time is less than 5×10^{-3} g, repeat the test using a new test specimen and a duration of boiling of 336 h (14 days).

7.5 After boiling for 168 h (or 336 h) empty the cylinder, cool and rinse it with water.

Take the test specimen from the testing apparatus and wipe it three times with the sponge (5.7), which has been soaked in water.

Carefully remove any packing residues from the edge of the specimen and dry it for 2 h in the drying oven (5.2) maintained at 110 ± 5 ° C. Allow to cool for 2 h in the desiccator (5.3) and weigh it to the nearest $0,2 \times 10^{-3}$ g (final mass).

7.6 Test specimens which show defects such as pinholes down to the metal, chipped edges or edge corrosion, are disregarded. However, a corresponding number of new specimens shall be tested.

8 Expression of results

8.1 The corrosion rate, $v_{K(7)}$, for a duration of boiling of 168 h (7 days), expressed in grams per square metre per day, is given by the equation

$$v_{K(7)} = \frac{\Delta m \times 10^4}{50 \times 7} = 28,57 \Delta m$$

where

Δm is the loss in mass, in grams, of the test specimen (starting mass minus final mass);

50 is the exposed area, in square centimetres, of the test specimen;

7 is the exposure time, in days, of the test specimen to the hydrochloric acid vapour.

Similarly, for a duration of boiling of 336 h (14 days), the corrosion rate, $v_{K(14)}$, expressed in grams per square metre per day, is given by the equation

$$v_{K(14)} = 14,28 \Delta m$$

8.2 Calculate the arithmetic mean of the individual values. The difference between the individual values of the corrosion rate shall not exceed 30 % of the arithmetic mean. If such is not the case, a further test shall be carried out. The four values shall be taken into account in calculating a new arithmetic mean.

9 Test report

The test report shall include the following information:

- a reference to this International Standard;
- the identification of the enamel tested;
- the testing temperature, in degrees Celsius;
- the duration of boiling, in days;
- the corrosion rate, $v_{K(7)}$ or $v_{K(14)}$, expressed in grams per square metre per day, rounded to the nearest 0,01 g/(m².d), giving the arithmetic mean and the number of single values.

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