SLOVENSKI STANDARD
oSIST prEN ISO 13807:2022

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Steklasti in porcelanski emajli - Ugotavljanje temperature pokanja emajlov za kemično industrijo zaradi izpostavljenosti toplotnemu šoku (ISO/DIS 13807:2022)

Vitreous and porcelain enamels - Determination of crack formation temperature in the thermal shock testing of enamels for the chemical industry (ISO/DIS 13807:2022)

Emails und Emaillierungen – Bestimmung der Rissbildungstemperatur von Chemie-Emails beim Abschreckversuch (ISO/DIS 13807:2022)

Émaux vitrifiés - Détermination de la température de fissuration par choc thermique d'émaux pour l'industrie chimique (ISO/DIS 13807:2022)

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Vitreous and porcelain enamels — Determination of crack formation temperature in the thermal shock testing of enamels for the chemical industry

Émaux vitrifiés — Détermination de la température de fissuration par choc thermique d'émaux pour l'industrie chimique

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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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13807 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*.

Annex A of this International Standard is for information only.

Vitreous and porcelain enamels — Determination of crack formation temperature in the thermal shock testing of enamels for the chemical industry

1 Scope

This International Standard specifies a test method for the determination of the crack formation temperature of enamels for the chemical industry by subjecting enamelled steel specimens to thermal shock using cold water.

The value of the crack formation temperature measured according to this test method is not valid for the finished component (see annex A). It is a parameter of vitreous and porcelain enamels for comparing the relative quality of different enamel formulations.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2746, *Vitreous and porcelain enamels — High voltage test*

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 3819, *Laboratory glassware — Beakers.*

ISO 19496-1, *Vitreous and porcelain enamels — Terminology — Part 1: Terms and definitions*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 19496-1 as well as the following apply.

3.1
crack formation temperature
thermal shock temperature at which the first damage to the enamel occurs in the form of cracks and/or chipping

3.2
thermal shock temperature
temperature of the specimen immediately before quenching with cold water

4 Designation

The test method for the determination of the crack formation temperature of enamels for the chemical industry by the thermal shock test described in this Intemational Standard is designated as follows:

Test ISO 13807

5 Principle

The specimen is heated to the thermal shock temperature in a drying oven. After reaching the thermal shock temperature, the enamelled surface is covered by water at a temperature between 10 °C and 30 °C. Then the specimen is dried and visually examined for damage. To make cracks visible, the entire enamel surface is sprayed with electrostatically charged talcum powder. If no damage to the enamel is found after the first thermal shock test, the test shall be repeated at a thermal shock temperature 10 °C higher than in the previous test.

6 Apparatus

6.1 Drying oven, capable of maintaining temperatures of at least 300 °C.

6.2 Low-form beaker, having a capacity of 2 000 ml meeting the requirements of ISO 3819.

6.3 Spray gun, equipped with a hard-rubber nozzle for electrostatically charging the talcum powder.

7 Specimens

7.1 Shape and preparation of specimens

Specimens shall be square sheet metal plates with a thickness of at least 10 mm and an edge length of 150 mm that have been enamelled on one side.

Alternatively, specimens as shown in Figure 1 made of 10MnTi3 low-alloyed enamelling structural steel may be used. The steel shall have the following nominal composition (% mass fraction):

— carbon, u 0,12 %;

— manganese, 0,40 % to 1,00 %;

— titanium 0,10 % to 0,16 %;

— phosphorus u 0,035 %;

— sulphur, u 0,030 %.

During the enamelling process, these specimens shall be held in the horizontal position by means of a rod inserted in the 5 mm hole. The ground coat shall cover the entire surface. The cover coat may be applied only to the top and convex surface (radius 8 mm).

Dimensions in millimetres Roughness values in micrometres

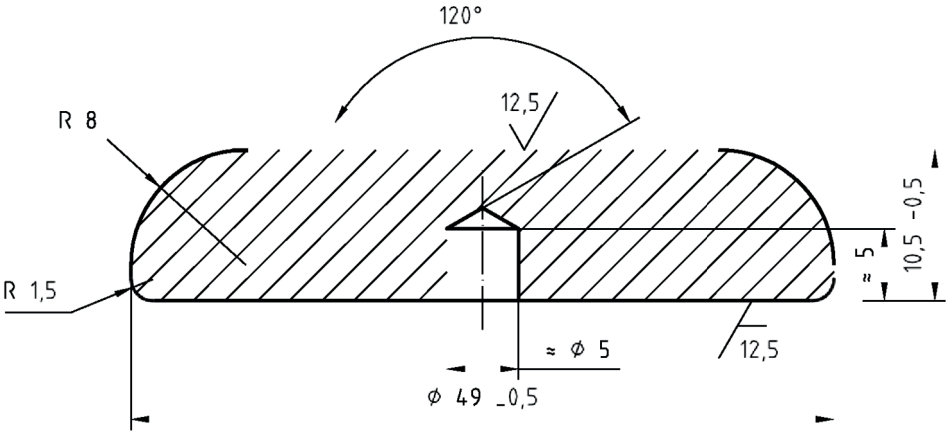

Figure 1 — Steel specimen for determination of the crack formation temperature of enamels by thermal shock

Prepare the specimens by the same enamelling process used for the enamelled product, including the pretreatment, type of ground and cover coat, application technique, firing temperature and thickness of the ground coat. After each firing step, the specimens are removed from the oven and may be cooled in air. However, the specimens shall be submitted to controlled cooling after the last coating or directly after the last firing. Heat the specimens up to 800 °C in an oven, maintain this temperature for at least 20 min, then cool to 250 °C at a cooling rate of u 1 °C/min (see annex A).

The overall thickness of the enamel measured by the method given in ISO 2808 shall be between 0,8 mm and 1,4 mm.

The finished enamel coating shall be free from defects. This shall be checked visually, as well as with the high voltage test at 12 kV described in ISO 2746.

Specimens of other shapes or manufacture may be used, when specified by the purchaser. The use of specimens having different shapes or manufacture shall be noted in the test report.

7.2 Number of specimens

Two specimens of the same type shall be used for each determination.

8 Procedure

8.1 Place the two enamelled specimens with the enamelled surface upwards in the drying oven (6.1) heated to the thermal shock temperature. The thermal shock temperature shall be about 20 °C below the expected crack formation temperature. If necessary, determine the crack formation temperature by a preliminary test.

8.2 Determine by a preliminary test, the time span necessary for heating the specimens to the thermal shock temperature. After the specimens have reached the thermal shock temperature, open the drying oven (6.1) and remove one specimen by means of a fork or other tool, without touching the enamel surface. Hold the specimen horizontally and cover the centre of it by pouring 2 l of water at a temperature between 10 °C and 30 °C, pouring the water at a rate of approximately 100 ml/s. From the moment the drying oven (6.1) is opened until the cold water is poured on to the specimen, no more than 3 s shall elapse.

8.3 After the first specimen has been removed from the drying oven (6.1), leave the second specimen in the oven until it has again reached the thermal shock temperature, then repeat the thermal shock step with the second specimen, by the procedure described in 8.2.

8.4 Check the dried specimens visually for damage to the enamel initially. Following the visual check, to make cracks easier to detect, spray the enamel with electrostatically charged talcum powder using the spray gun (6.3). This technique will make even fine cracks easy to detect.

8.5 If no damage to the enamel is detected on one or both specimens after the thermal shock test, repeat the test on the same specimens at a thermal shock temperature that is 10 °C higher than in the first test.

8.6 If the difference in the crack formation temperature as determined by the above procedure is greater than 10 °C, the test shall be repeated with two new specimens.

9 Expression of results

Average the crack formation temperatures that do not differ by more than 10 °C.

10 Test report

The test report shall include the following information:

a) the type of enamel tested;

b) the designation (see clause 4) of this test method, i.e. Test ISO 13807;

c) the thickness of the enamel coating;

d) the material code or designation of the basis metal;

e) if applicable, the shape of the specimen, if specified by the purchaser (see clause 7);

f) the description of the damage to the enamel coating;

g) the individual values of the crack formation temperatures, in °C;

h) the arithmetic mean of the crack formation temperature, in °C.