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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 28706-2

Vitreous and porcelain enamels — Determination of resistance to chemical corrosion —

Part 2: Determination of resistance to chemical corrosion by boiling acids, boiling neutral liquids, alkaline liquids and/or their vapours

Émaux vitrifiés — Détermination de la résistance à la corrosion chimique —

Partie 2: Détermination de la résistance à la corrosion chimique par des acides bouillants, des liquides neutres bouillants, ou des liquides alcalins et/ou leurs vapeurs

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This document is circulated as received from the committee secretariat.

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Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	2
5 Reagents	2
6 Apparatus and materials	2
6.1 Test apparatus	2
6.2 Test materials	7
7 Packing rings	7
7.1 General	7
7.2 Packing A	7
7.3 Packing B	7
8 Test specimens	8
9 Procedure	8
10 Expression of results	9
10.1 Total loss in mass per unit area	9
10.2 Corrosion rate	9
11 Boiling citric acid	9
11.1 General	9
11.2 Test solution	10
11.3 Duration of the test	10
11.4 Test report	10
12 Boiling sulfuric acid	10
12.1 General	10
12.2 Test solution	10
12.3 Duration of the test	10
12.4 Test report	11
13 Boiling hydrochloric acid	11
13.1 General	11
13.2 Test solution	11
13.3 Duration of the test	11
13.4 Test report	11
14 Boiling distilled or demineralized water	12
14.1 General	12
14.2 Test solution	12
14.3 Duration of the test	12
14.4 Test report	12
15 Standard detergent solution	13
15.1 General	13
15.2 Test solution	13
15.3 Test temperature	13
15.4 Duration of the test	13
15.5 Test report	14
16 Other test solutions and/or conditions	14
16.1 General	14
16.2 Test solution	14

16.3 Duration of the test..... 14

16.4 Test report..... 14

Bibliography..... 16

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*.

This third edition cancels and replaces the second edition (ISO 28706-2:2017), which has been technically revised with changes as follows.

- The simmering aid part of the test apparatus has been removed as it is not required for this test.
- The testing procedure has been updated to include the requirement for tests to be carried out in a temperature controlled environment and to define a time for emptying the test cycliner.

A list of all parts in the ISO 28706 series can be found on the ISO website.

Introduction

Corrosion of vitreous and porcelain enamels by aqueous solutions is a dissolution process. The main component of the enamel, SiO₂, forms a three-dimensional silica network. After hydrolysis, it decomposes and forms silicic acid or silicates. These are released into the attacking medium. Other components, mainly metal oxides, are hydrolysed as well and form the corresponding hydrated metal ions or hydroxides. All corrosion products are more or less soluble in the attacking medium. The whole process results in a loss in mass per unit area.

For some aqueous solutions, the attack on the enamel proceeds linearly during the corrosion time; for other aqueous solutions, the attack on the enamel proceeds in a logarithmic manner during the corrosion time. Only for the first series of solutions can a scientifically exact rate of loss in mass per unit area (g/m²·h) be calculated as well as a corrosion rate (millimetres per year).

The most important parameters influencing aqueous corrosion of the enamel are the enamel quality, the temperature and the pH value. Inhibition effects resulting from the limited solubility of silica can also contribute. The following list describes different types of enamel attack for different corrosion conditions.

- a) In aqueous alkali solutions such as 0,1 mol/l NaOH (see ISO 28706-4:2016, Clause 9), the silica network of the enamel is considerably attacked at 80 °C. Silicates and most of the other hydrolysed components are soluble in the alkali. Attack proceeds linearly during regular test times. Therefore, test results are expressed in terms of a rate of loss in mass per unit area (mass loss per unit area and time) and a corrosion rate (millimetres per year).
- b) At room temperature, in weak aqueous acids such as citric acid (see ISO 28706-1:2008, Clause 9) or also in stronger acids such as sulfuric acid (see ISO 28706-1:2008, Clause 10), there is only minor attack on the silica network of the enamel. Other constituents are leached to some extent from the surface. Highly resistant enamels will show no visual change after exposure. On less resistant enamels, some staining or surface roughening will occur.
- c) In boiling aqueous acids (as described in this document), the silica network of the enamel is being attacked, and silica as well as the other enamel components are released into solution. However, the solubility of silica in acids is low. Soon, the attacking solutions will become saturated with dissolved silica and will then only leach the surface. The acid attack is inhibited and the rate of corrosion drops markedly.

NOTE The glass test equipment also releases silica by acid attack and contributes to the inhibition of the corrosion.

Inhibition is effectively prevented in vapour phase tests. The condensate formed on the test specimen is free of any dissolved enamel constituents.

Examples of enamel corrosion proceeding in a logarithmic manner [see 1)] and linearly [see 2)] are as follows:

- 1) **Boiling citric acid** (see [Clause 11](#)) and **boiling 30 % sulfuric acid** (see [Clause 12](#)).

Since only minute amounts of these acids are found in their vapours, the test is restricted to the liquid phase. The attack is influenced by inhibition effects and corrosion depends on the time of exposure. Therefore, test results are expressed in terms of loss in mass per unit area; no rate of loss in mass per unit area is calculated.

- 2) **Boiling 20 % hydrochloric acid** (see [Clause 13](#)).

Since this is an azeotropic boiling acid, its concentration in the liquid and the vapour phase are identical, and liquid phase testing need not be performed. Vigorous boiling supplies an uninhibited condensate, and the attack proceeds linearly with time of exposure. Therefore, test results are only expressed in terms of rate of loss in mass per unit area (mass loss per unit area and time) and the corrosion rate (millimetres per year).