

English version

Paints and varnishes

**Determination of resistance to filiform corrosion
Part 2: Aluminium substrates
(ISO 4623-2 : 2003)**

Peintures et vernis – Détermination
de la résistance à la corrosion fili-
forme – Partie 2: Subjectiles en
aluminium (ISO 4623-2 : 2003)

Beschichtungsstoffe – Bestimmung
der Beständigkeit gegen Filiform-
korrosion – Teil 2: Aluminium als
Substrat (ISO 4623-2 : 2003)

This European Standard was approved by CEN on 2004-02-26.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

International Standard

ISO 4623-2 : 2003 Paints and varnishes – Determination of resistance to filiform corrosion – Part 2: Aluminium substrates,

which was prepared by ISO/TC 35 'Paints and varnishes' of the International Organization for Standardization, has been adopted by Technical Committee CEN/TC 139 'Paints and varnishes', the Secretariat of which is held by DIN, as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by October 2004 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 4623-2 : 2003 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to international publications are listed in Annex ZA (normative).

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Introduction

A scribe mark cut through a coating of paints or varnishes on metal can give rise to various types of corrosion, such as blistering of the coating, corrosion of the metal under the coating as well as filiform corrosion. Filiform corrosion tends to develop under specific conditions of temperature and relative humidity and when traces of acids, bases or salts are present either under the paint coating or at breaks in the coating. These conditions are often found in marine and/or industrial environments. A certain amount of under-corrosion of the substrate, starting from the scribe mark, will always occur. Filiform corrosion, however, is considered to be present only if the typical pattern in the form of threads is obvious.

1 Scope

This part of ISO 4623 describes a test procedure for assessing the protective action of coatings of paints or varnishes on aluminium against filiform corrosion arising from a scribe mark cut through the coating.

It is only suitable for assessing the performance of the coating/substrate combination tested. It is not suitable for predicting the performance of the coating on different substrates.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1513, *Paints and varnishes — Examination and preparation of samples for testing*

ISO 1514, *Paints and varnishes — Standard panels for testing*

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

ISO 3270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*

ISO 4628-8, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 8: Evaluation of corrosion around a scribe*

ISO 4628-10, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 10: Assessment of filiform corrosion*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 filiform corrosion

type of corrosion proceeding under a coat of paint, varnish or related product, in the form of threads, generally starting from bare edges or from local damage to the coating

NOTE Usually the threads are irregular in length and direction of growth, but they may also be nearly parallel and of approximately equal length. They usually follow the extrusion direction and do not cross over one another. They need to be initiated by aggressive ions.

4 Principle

A coated test panel is scribed in a defined way. A small amount of hydrochloric acid is introduced into the scribe mark by exposure to hydrochloric acid vapour. The panel is then exposed in a test cabinet at 40 °C and a relative humidity of 82 %. The effects of exposure are then evaluated by criteria agreed in advance between the interested parties, these criteria usually being either of a subjective nature or as given in ISO 4628-10.

5 Required supplementary information

For any particular application, the test method specified in this part of ISO 4623 needs to be completed by supplementary information. The items of supplementary information are given in Annex A.

6 Sampling

Take a representative sample of the product to be tested (or of each product in the case of a multicoat system), as specified in ISO 15528.

Examine and prepare each sample for testing, as specified in ISO 1513.

7 Apparatus

Ordinary laboratory apparatus and glassware, together with the following:

7.1 Test cabinet, capable of being maintained at $(40 \pm 2)^\circ\text{C}$ and a relative humidity of $(82 \pm 5)\%$. The cabinet shall have provision for maintaining the panels in a horizontal position (see Note) at least 20 mm apart or, if specified, provision for placing or hanging the test panels in an approximately vertical position so that the distance between the faces of adjacent panels is at least 20 mm.

NOTE Due to the hygroscopic action of the hydrochloric acid in the scribe mark, mixtures of water droplets and hydrochloric acid can be formed. Horizontal exposure will result in more corrosion which proceeds in a more regular manner along the length of each scribe mark.

7.2 Container, made of acid-resistant material, with a lid, and capable of holding the test panels at a distance of (100 ± 10) mm from the surface of the acid and at least 20 mm from each other.

7.3 Scribe tool, consisting of a sharp instrument which will produce scribe marks with the dimensions specified in 10.2 and with well-defined edges. There are many scribe tools available, and the result of the test will vary depending on the tool used. A description of the scribe tool shall be given in the test report [see Clause 13, item f)].

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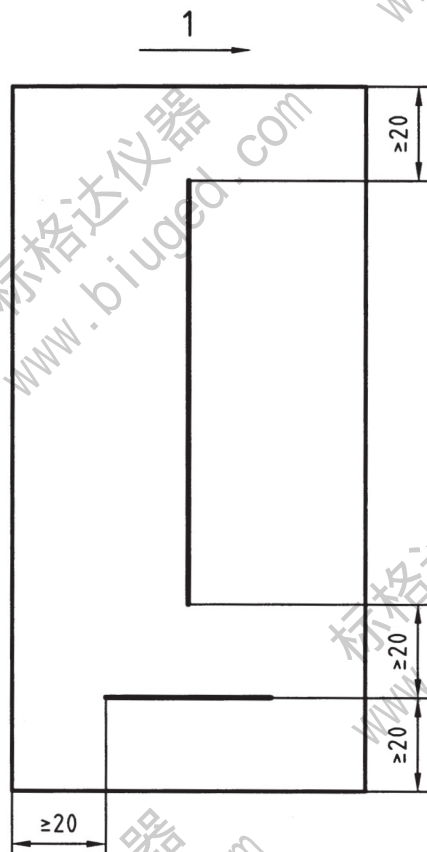
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If the aluminium has surface cladding, then the scribe mark shall penetrate through the cladding layer by 0,05 mm to 0,1 mm.

Different scribing devices produce different amounts of corrosion in the scribe mark, therefore the manner of scribing and the type of tool used shall be reported.

Dimensions in millimetres



Key

1 rolling direction

Figure 1 — Positions of scribe marks

10.3 Testing

Into the container (7.2), place (20 ± 2) ml of hydrochloric acid (8.1) per litre of container volume. Place the test panels in the container, face down, with the scribe marks exposed to the vapour. The distance between the test panels and the surface of the liquid shall be (100 ± 10) mm, and they shall be at least 20 mm apart from each other. Place the lid on the container and keep for (60 ± 5) min at a temperature of (23 ± 2) °C. Remove the test panels, allow them to stand at the standard conditions defined in ISO 3270 for 15 to 30 minutes and then immediately place them in the test cabinet (7.1) at (40 ± 2) °C and (82 ± 5) % relative humidity until the end of the specified test period.

NOTE It is recommended that a control specimen prepared from a paint of known durability be included with each series of test panels.

10.4 Inspection of test panels

Where appropriate, at the specified intervals and on completion of the test, inspect the test panels for filiform corrosion (see Clause 11). During inspection, the panels shall not be allowed to remain out of the cabinet for more than 30 min, as a longer time may affect the development of the filiform corrosion.

If the coating is removed (by stripping) at specified intervals, make sure that enough test panels are placed in the cabinet at the beginning of the test.

11 Evaluation of the degree of filiform corrosion

Determine the length of the longest filament M and the most frequently occurring length m of the filiform threads as described in ISO 4628-10.

Report the results for the two scribe marks separately, as the scribe mark which is perpendicular to the rolling direction will show much more and longer filiform corrosion.

If specified, determine corrosion other than filiform about the scribe marks as described in ISO 4628-8.

If specified, remove the coating with a non-corrosive paint remover and re-examine the substrate.

NOTE Photographs of the test panels taken at the end of the test may be helpful in assessing the extent of the filiform corrosion.

12 Precision

No relevant precision data are currently available.

ISO/TC 35 intends to obtain precision data for all relevant standards, including this part of ISO 4623. When precision data are available, they will be incorporated in this document.

13 Test report

The test report shall contain at least the following information:

- a) all details necessary to identify the product tested;
- b) a reference to this part of ISO 4623 and its year of publication (ISO 4623-2:2003);
- c) the items of supplementary information referred to in Annex A;
- d) a reference to the international or national standard, product specification or other document supplying the information referred to in c);
- e) the duration of the test (see 10.3 and Annex A) and the intervals of inspection (see 10.4);
- f) a description of the scribe tool used and the dimensions and location of each scribe mark;
- g) the results of the test as indicated in Clause 11;
- h) any deviations, by agreement or otherwise, from the test procedure described;
- i) the dates of the test.

Annex A **(normative)**

Required supplementary information

The items of supplementary information listed in this annex shall be supplied as appropriate to enable the method to be carried out.

NOTE The information required should preferably be agreed between the interested parties and may be derived, in part or totally, from an international or national standard or other document related to the product under test.

- a) The material, dimensions and surface preparation of the substrate (see 9.1 and 9.2).
- b) The method of application of the test coating and details of the sealing of the edges and backs of the test panels (if required) (see 9.2).
- c) The thickness, in micrometres, of the dry coating, including the method of measurement in accordance with ISO 2808 and whether it is a single coating or a multicoat system (see 9.4).
- d) The duration and conditions of drying (or stoving) and ageing (if applicable) of the coated test panels before testing (see 9.3).
- e) Whether the panels are to be placed horizontally or vertically in the test cabinet (see 7.1).
- f) The duration of the test (see 10.3).
- g) How inspection of the test coating is to be carried out and what characteristics are to be considered in evaluating its resistance to filiform corrosion (see 10.4 and Clause 11).

Annex ZA
(normative)**Normative references to international publications
with their relevant European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN</u>	<u>Year</u>
ISO 1514	1993	Paints and varnishes - Standard panels for testing	EN ISO 1514	1997
ISO 2808	1997	Paints and varnishes - Determination of film thickness	EN ISO 2808	1999
ISO 3270	1984	Paints and varnishes and their raw materials - Temperatures and humidities for conditioning and testing	EN 23270	1991
ISO 15528	2000	Paints, varnishes and raw materials for paints and varnishes - Sampling	EN ISO 15528	2000