BRITISH STANDARD

BS EN
12373-7:1999

Aluminium and aluminium alloys — Anodizing —

Part 7: Assessment of quality of sealed anodic oxidation coatings by measurement of the loss of mass after immersion in phosphoric acid/chromic acid solution with prior acid treatment

The European Standard EN 12373-7:1998 has the status of a British Standard

ICS 25.220.20; 77.120.10

National foreword

This British Standard is the English language version of EN 12373-7:1998.

The UK participation in its preparation was entrusted to Technical Committee STI/32, Anodic oxidation coatings on aluminium, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 5 and a back cover.

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English version

Aluminium and aluminium alloys — Anodizing — Part 7: Assessment of quality of sealed anodic oxidation coatings by measurement of the loss of mass after immersion in phosphoric acid/chromic acid solution with prior acid treatment

Aluminium et alliages d'aluminium — Anodisation — Partie 7: Evaluation de la qualité des couches anodiques colmatées par mesurage de la perte de masse après immersion en solution phosphochromique avec traitement acide préalable

Aluminium und Aluminiumlegierungen — Anodisieren — Teil 7: Prüfung der Qualität von verdichteten, anodisch erzeugten Oxidschichten durch Bestimmung des Massenverlustes nach Eintauchen in Chromphosphorsäure-Lösung mit vorheriger Säurebehandlung

This European Standard was approved by CEN on 5 November 1998.

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CEN

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

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 12373-7:1998 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 132, Aluminium and aluminium alloys, the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 1999, and conflicting national standards shall be withdrawn at the latest by May 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

In this standard, annex A is normative.

EN 12373, *Aluminium and aluminium alloys — Anodizing*, comprises the following parts:

— *Part 1: Method for specifying decorative and protective anodic oxidation coatings on aluminium*;

— *Part 2: Determination of mass per unit area (surface density) of anodic oxidation coatings — Gravimetric method*;

— *Part 3: Determination of thickness of anodic oxidation coatings — Non-destructive measurement by split-beam microscope*;

— *Part 4: Estimation of loss of absorptive power of anodic oxidation coatings after sealing by dye spot test with prior acid treatment*;

— *Part 5: Assessment of quality of sealed anodic oxidation coatings by measurement of admittance*;

— *Part 6: Assessment of quality of sealed anodic oxidation coatings by measurement of the loss of mass after immersion in phosphoric acid/chromic acid solution without prior acid treatment*;

— *Part 7: Assessment of quality of sealed anodic oxidation coatings by measurement of the loss of mass after immersion in phosphoric acid/chromic acid solution with prior acid treatment*;

— *Part 8: Determination of the comparative fastness to ultra-violet light and heat of coloured anodic oxidation coatings*;

— *Part 9: Measurement of wear resistance and wear index of anodic oxidation coatings using an abrasive wheel wear test apparatus*;

— *Part 10: Measurement of mean specific abrasion resistance of anodic oxidation coatings using an abrasive jet test apparatus*;

— *Part 11: Measurement of specular reflectance and specular gloss of anodic oxidation coatings at angles of 20°, 45°, 60° or 85°*;

— *Part 12: Measurement of reflectance characteristics of aluminium surfaces using integrating-sphere instruments*;

— *Part 13: Measurement of reflectivity characteristics of aluminium surfaces using a goniophotometer or an abridged goniophotometer*;

— *Part 14: Visual determination of image clarity of anodic oxidation coatings — Chart scale method*;

— *Part 15: Assessment of resistance of anodic oxidation coatings to cracking by deformation*;

— *Part 16: Check for continuity of thin anodic oxidation coatings — Copper sulfate test*;

— *Part 17: Determination of electric breakdown potential*;

— *Part 18: Rating system for the evaluation of pitting corrosion — Chart method*;

— *Part 19: Rating system for the evaluation of pitting corrosion — Grid method.*

Contents

1 Scope

This part of this European Standard specifies a method of assessing the quality of sealed anodic oxidation coatings on aluminium and its alloys by measurement of the loss of mass after immersion in phosphoric acid/chromic acid solution with prior acid treatment. A related standard (EN 12373-6[1)]) describes the same method used *without* prior acid treatment.

The method is particularly applicable to anodic oxidation coatings intended for architectural purposes. For less severe applications, the method described in EN 12373-6[1)] may be more suitable.

The method is not applicable to:

— hard-type anodic oxidation coatings which normally are not sealed;

— anodic oxidation coatings that have been sealed only in dichromate solutions;

— anodic oxidation coatings produced in chromic acid solutions;

— anodic oxidation coatings that have undergone a treatment to render them hydrophobic.

The method is destructive and can serve as a reference method in case of doubt or dispute regarding the results of the test for loss of absorptive power (EN 12373-4[1)]), or the measurement of admittance (EN 12373-5[1)]).

2 Principle

An unsealed anodic oxidation coating on aluminium is dissolved rapidly by acid media, whereas a well-sealed coating will withstand long immersion without appreciable attack.

3 Reagents

Use only reagents of recognized analytical grade and distilled water, or water of equivalent purity.

3.1 *Predip*. Aqueous solution containing, per litre, 650 ml nitric acid (ρ_{20} = 1,4 g/ml).

3.2 *Test solution*. Aqueous solution containing, per litre, 35 ml phosphoric acid (ρ_{20} = 1,7 g/ml) and 20 g chromium(VI) oxide.

4 Apparatus

Usual laboratory apparatus and glassware, together with the following.

Laboratory balance, capable of weighing to an accuracy of 0,1 mg.

5 Preparation of test piece

Cut a test piece from the material to be tested, avoiding contact areas, such that there is an area of approximately 1 dm^2, but not less than 0,5 dm^2, of significant surface area. Normally, the mass of the test piece should not exceed 200 g.

For hollow extrusions, take the test piece from the end of the sections where the total surface area has an anodic oxidation coating (due to the throwing power of the anodizing electrolyte).

NOTE In special cases, such as certain types of jigging, small hollow sections etc., it will be necessary to remove the anodic oxidation coating from the inside surface and to carry out the test on the coating on the outer surface of the extrusion.

6 Procedure

6.1 Measure the total coated area of the test piece (excluding cut edges and other uncoated surfaces).

NOTE The predip and the test solution do not attack bare metal, and it is not necessary to take uncoated surfaces into account.

Remove any surface bloom from the test piece by rubbing with a dry cloth.

6.2 Degrease the test piece in an organic solvent, e.g. acetone or ethanol 96 % (*V/V*), at room temperature according to the method described in **A.1**.

6.3 Dry the test piece thoroughly (see **A.1** and **A.2**) and weigh immediately to the nearest 0,1 mg (m_1).

6.4 Immerse the test piece completely, standing it upright, in the predip (see **3.1**) and leave for 10 min at a temperature of 19 °C ± 1 °C.

6.5 Take the test piece from the predip and rinse thoroughly, first under running water and then in distilled water.

6.6 Immerse the test piece completely, standing it upright, in the test solution (see **3.2**) and leave for exactly 15 min at a constant temperature of 38 °C ± 1 °C.

NOTE Uniformity of temperature within the test solution is very important; this can be achieved by using a water-bath and stirring continuously.

Do not use the test solution after more than 10 dm^2 of anodized surface have been treated per litre of solution.

Do not use test solution which has been in contact with materials other than anodized aluminium or its alloys.

6.7 Take the test piece from the test solution and rinse thoroughly, first under running water and then in distilled water. Dry the test piece as indicated in annex A and weigh immediately to the nearest 0,1 mg (m_2).

6.8 During the operations described in **6.2** to **6.7**, avoid touching the test piece with bare hands.

Take extreme care that the two drying operations in **6.3** and **6.7** are carried out in the same reproducible way, and avoid heating to temperatures above 60 °C.

[1)] See foreword.

7 Expression of results

Calculate the loss in mass per unit area of surface, δ_A, in milligrams per square decimetre, using the equation:

$$\delta_A = \frac{m_1 - m_2}{A} \quad (1)$$

where

m_1 is the mass, in milligrams, of the test piece before immersion in the predip and test solution;

m_2 is the mass, in milligrams, of the test piece after immersion in the predip and test solution;

A is the coated surface area of the test piece, in square decimetres, in contact with the predip and test solution.

8 Test report

The test report shall contain at least the following information:

a) the type and identification of the product tested;

b) a reference to this European Standard;

c) how the significant surface area has been determined;

d) whether the test solution has been stirred;

e) the result of the test (see clause **7**);

NOTE Acceptance levels will normally be specified in the relevant product specification.

f) any deviation, by agreement or otherwise, from the procedure specified;

g) the date of the test.

Annex A (normative)
Method for the drying of samples

A.1 Degrease the test piece by gentle agitation for 30 s in a suitable organic solvent at room temperature; remove; leave for 5 min in the ambient atmosphere (pre-drying); place in a drying oven preheated to 60 °C and leave for exactly 15 min with the coated surfaces standing upright.

WARNING NOTE Where organic solvents are used, carry out the degreasing operation and the pre-drying in a well-ventilated area to minimize exposure to solvent vapour.

A.2 Allow the test piece to cool for 30 min over silica gel in a closed desiccator.

A.3 After the acid treatment and rinsing (see **6.7**), repeat operations **A.1** and **A.2**, omitting the treatment in the organic solvent.

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