SLOVENSKI STANDARD
SIST EN 12373-9:1999

01-november-1999

Aluminij in aluminijeve zlitine - Anodna oksidacija - 9. del: Meritve obrabne obstojnosti in obrabnega števila anodnooksidiranih prevlek z brusnim kolutom

Aluminium and aluminium alloys - Anodizing - Part 9: Measurement of wear resistance and wear index of anodic oxidation coatings using an abrasive wheel wear test apparatus

Aluminium und Aluminiumlegierungen - Anodisieren - Teil 9: Messung der Abriebfestigkeit und der Abriebzahl von anodisch erzeugten Oxidschichten durch Abriebprüfung mit einem Schleifscheiben-Prüfgerät

Aluminium et alliages d'aluminium - Anodisation - Partie 9: Détermination de la résistance a l'usure et de l'indice d'usure des couches d'oxyde anodiques par essai a la roue abrasive

Ta slovenski standard je istoveten z: EN 12373-9:1998

ICS:

25.220.20	Površinska obdelava	Surface treatment
77.120.10	Aluminij in aluminijeve zlitine	Aluminium and aluminium alloys

SIST EN 12373-9:1999 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12373-9

November 1998

ICS 25.220.20; 77.120.10

Descriptors: surface treatment, anodizing, aluminium, aluminium alloys, wear tests, determination, wear resistance, abrasion resistance, specimen preparation

English version

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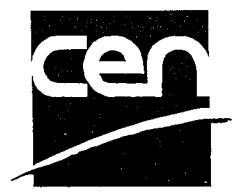

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COMITÉ EUROPÉEN DE NORMALISATION
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Contents

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of an identical text or by endorsement, at the latest by May 1999, and conflicting national standards shall be withdrawn at the latest by May 1999.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.

It is based upon ISO 8251 : 1987.

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 oxide 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

Introduction

Wear resistance can be closely related to the quality of an anodic oxidation coating, and its performance in service, since it is dependent upon the composition of the metal, the thickness of the coating, and the conditions of anodizing and sealing. For example, the effect of an abnormally high anodizing temperature, which could cause potential deterioration in service by chalking of the surface layers, can be readily detected by means of an abrasive wear resistance test.

1 Scope

This Part of this European Standard specifies a method of test for determining the wear resistance and the wear index of anodic oxidation coatings on flat specimens of aluminium and its alloys by means of an abrasive wheel wear test apparatus.

The wear resistance or the wear index of the layers of oxide near the surface, or of the whole oxidation coating thickness, or of any selected intermediate zone, can be determined by the method described. For most purposes the wear index (see 7.3) or the mass wear index (see 7.4) will be the most appropriate characteristic to determine.

The method is applicable to all anodic oxidation coatings of thickness not less than 5 µm on flat aluminium specimens.

This method is not applicable to concave or convex specimens; these may be examined using the abrasive jet test method (see EN 12373-10[1)]) which will give an average value for the abrasion resistance of the coating.

NOTE: Minimum test specimen dimensions of 50 mm × 50 mm are normally required.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in this 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.

EN ISO 2360 Non-conductive coatings on non-magnetic basis metals – Measurement of coating thickness – Eddy current method (ISO 2360 : 1982)

[1)] See foreword.

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1 test piece: Specimen on which the test is to be carried out.

3.2 standard specimen: Specially prepared anodized test specimen produced in accordance with annex A.

3.3 reference specimen: Test specimen produced under conditions agreed between the purchaser and the anodizer.

3.4 double stroke: One complete reciprocal movement made by the abrasive wheel.

4 Principle

The anodic oxidation coating on a specimen is abraded, under defined conditions, by reciprocal motion against a strip of silicon carbide paper attached to the outer circumference of a wheel. After each double stroke, the wheel turns through a small angle to bring an unused portion of the abrasive strip into contact with the test area. The decrease in coating thickness, or mass, obtained is used to calculate the wear index or wear resistance. This result is compared with that obtained using a standard specimen (see annex A) or some other reference specimen.

NOTE 1: The method normally requires an eddy current coating thickness meter with a probe of less than 12 mm diameter. If this is not available, then the method of loss in mass should be used.

NOTE 2: A complete presentation of the wear characteristics of the anodic oxidation coating can be obtained by progressively abrading the test area, until the substrate metal is revealed, and then constructing a graph to show the relation between the coating thickness removed and the number of double strokes used. This is referred to as a depth survey of the anodic oxidation coating (see 6.4).

5 Apparatus

5.1 Abrasive wheel wear test apparatus

The apparatus consists of a clamping device or pressure plate for holding the specimen (see 6.1.2) level and rigid, and a 50 mm diameter wheel, to the outer circumference of which is attached a 12 mm wide strip of silicon carbide paper (see 5.2). The force between the wheel and the test surface shall be capable of being varied from zero to at least 4,9 N, with an accuracy of ± 0,05 N. The abrasive action is produced either by the fixed wheel sliding to and fro in a horizontal plane in parallel contact with the test surface over a 30 mm length or, alternatively, by the test specimen sliding in a similar way over the stationary wheel.

After each double stroke, the wheel is advanced through a small angle to bring a fresh area of the silicon carbide paper into contact with the surface before making the next double stroke. The angle of rotation is such that after 400 double strokes the wheel will have made one complete revolution. At this stage the strip of silicon carbide paper shall be renewed. The relative speed of movement shall be (40 ± 2) double strokes per minute. The number of double strokes can be registered by means of a counter and provision is normally made for the apparatus to switch off automatically after a preset number of double strokes has been reached (400 maximum). The test surface shall be kept free from loose powder or abrasion detritus during the test.

5.2 Abrasive strip

The abrasive strip consists of 45 µm (320 mesh) grade silicon carbide paper 12 mm wide. Its length shall be such that it covers the abrasive wheel without overlapping, and it shall be either bonded or mechanically clamped into position.

5.3 Eddy current meter

Eddy current meter with suitable diameter probe (see EN ISO 2360 : 1995).

6 Procedure

6.1 Specimens with coatings produced by sulfuric acid anodizing

6.1.1 *Standard specimen*

Prepare the standard specimen in accordance with annex A.

6.1.2 *Test piece*

Cut a suitably sized test piece from the item to be tested without damaging the area to be tested.

NOTE: Test piece dimensions of 50 mm × 50 mm are usually required (but see 6.1.4).

6.1.3 *Calibration of apparatus*

6.1.3.1 Select and mark the area of the standard specimen (see 6.1.1) to be abraded. Accurately measure the anodic oxidation coating thickness in each of at least three positions along the test area by means of the eddy current meter (5.3) in accordance with the method specified in EN ISO 2360 : 1995 and calculate an average thickness value (d_1) .

6.1.3.2 Clamp the standard specimen into position on the apparatus (5.1).

6.1.3.3 Attach a new strip of silicon carbide paper (5.2) to the circumference of the abrasive wheel. Adjust the abrasive wheel, in accordance with the manufacturer's instructions, so that it gives