SLOVENSKI STANDARD
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Aluminij in aluminijeve zlitine - Anodizacija - 17. del: Ugotavljanje elektriļne prebojne napetosti

Aluminium and aluminium alloys - Anodizing - Part 17: Determination of electric breakdown potential

Aluminium und Aluminiumlegierungen - Anodisieren - Teil 17: Bestimmung der elektrischen Durchschlagspannung

Aluminium et alliages d'aluminium - Anodisation - Partie 17: Détermination de la tension électrique de claquage

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Aluminium and aluminium alloys - Anodizing - Part 17: Determination of electric breakdown potential

Aluminium et alliages d'aluminium - Anodisation - Partie 17: Détermination de la tension électrique de claquage

Aluminium und Aluminiumlegierungen - Anodisieren - Teil 17: Bestimmung der elektrischen Durchschlagspannung

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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of an identical text or by endorsement, at the latest by November 2001, and conflicting national standards shall be withdrawn at the latest by November 2001.

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 in 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 in 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

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.

1 Scope

This Part of this European Standard specifies methods of test for the determination of the electrical breakdown potential of anodic oxidation coatings on aluminium and its alloys on flat or near-flat surfaces and on round wire. The methods are applicable to anodic oxidation coatings used primarily as electrical insulators.

The methods are not applicable to coatings in the vicinity of cut edges, the edges of holes, or sharp changes of angle on, for example, extruded shapes.

NOTE 1 The methods described do not give satisfactory results for unsealed coatings.

NOTE 2 Electrical breakdown potential is affected by relative humidity.

2 Principle

The electric voltage at which current first passes through an anodic oxidation coating is measured; this breakdown potential is a function of the dielectric characteristics and the insulation properties of the oxide coating. The breakdown potential depends upon the thickness of the coating, as well as on many other factors, particularly the composition of the basis metal, its surface condition, the effectiveness of sealing, the dryness of the sample and degree of ageing.

3 Apparatus

3.1 Power supply, from a suitable 50 Hz source.

3.2 a.c. transformer, having an output with a waveform as nearly sinusoidal as possible, capable of producing the potential required.

3.3 Voltage regulator, enabling the test potential to be increased gradually from any point without interruption, and providing an essentially undistorted waveform so that peak potential shall be within the limits $\sqrt{2}$ ± 5 % (i.e. 1,34 to 1,48) of the r.m.s. potential.

3.4 Current limiting resistor, 0,5 MΩ, in series with the transformer secondary winding and the test electrode probe (3.6).

3.5 Potential-measuring device, which gives r.m.s. values, expressed in volts.

3.6 Electrode probe, made from conducting material, suitably insulated for handling purposes, free to move as required and adequately supported. The contact surface shall be spherical with a diameter of 3 mm to 8 mm and shall be maintained in a smooth, untarnished condition. The design of the probe shall be such that, when the spherical surface is placed on the surface of the anodized test specimen, the total force exerted on the coating is 0,5 N to 1,0 N (a probe of mass 50 g to 100 g is suitable).

3.7 Contact plate, for testing flat test specimens, having a smooth, bright, metallic surface, or a contact probe or clip which is capable of breaking through to the basis metal (see 4.2.1).

3.8 Twisting machine, for testing round wire, having two sets of jaws 400 mm apart, with one set of jaws fixed, while the other set is free to rotate. The jaws shall be mounted so as to prevent lateral movement of the jaws when the twisting operation is carried out (see 4.2.2).

4 Procedure

4.1 Test specimen

The test specimen shall normally consist of a production component (or a part thereof). It shall be sealed, dry and clean and, if required, shaped to correspond to its ultimate use in service.

Unsealed items may be tested but only under conditions of known, recorded and controlled relative humidity.

NOTE The use of specially prepared test specimens, processed at the same time and in the same manner as production articles, can lead to erroneous results.

4.2 Determination

4.2.1 *Flat or near-flat surfaces*

Unless otherwise specified, carry out the determination at room temperature. Measure and record the relative humidity of the environment in which the test is taking place. Place the test specimen on the contact plate (3.7) in good electrical contact with it, for example, by using an earthing clip. Alternatively make contact to the basis metal using the contact probe or clip.

Connect the contact plate or contact probe or clip (3.7) and the electrode probe (3.6) to opposite poles of the secondary winding of the transformer (3.2) and place the probe on the test specimen so that the force exerted on the coating is 0,5 N to 1,0 N (see 3.6).

Starting at zero, increase the potential uniformly at a rate not exceeding 25 V/s until the specified potential is reached or the potential drops suddenly (indicating electrical breakdown of the coating). It is necessary to clean the contact surface of the probe after any breakdown has occurred, and it is essential to return the potential to zero after each determination and particularly before cleaning the probe.

Carry out a minimum of five tests and record the lowest value obtained. Alternatively, ascertain whether or not any value falls below a predetermined electrical breakdown potential.

4.2.2 *Round wire*

Unless otherwise specified, carry out the determination at room temperature. Measure and record the relative humidity of the environment in which the test is taking place.

Twist together two suitable lengths of wire using the twisting machine (3.8) so that the number of twists per 50 mm specified in table 1 is achieved.

Table 1 - Number of twists for round wire test specimens

Diameter of wire d mm	**Number of twists per 50 mm**
$0,2 \leq d \leq 0,3$	5
$0,3 < d \leq 0,5$	4
$0,5 < d \leq 0,75$	3
$0,75 < d \leq 1,25$	2
$1,25 < d \leq 3,25$	1
$3,25 < d \leq 6,5$	0,5

Ensure that the two lengths of wire are of equal length between the jaws, are under equal tension and are touching in the jaws.

Remove the wires from the twisting machine, separate the wires for about 50 mm at each end, and remove the anodic coating from one pair of ends. Join the opposite poles of the secondary winding of the transformer to these exposed ends.

Starting at zero, increase the potential uniformly at a rate not exceeding 25 V/s until the specified potential is reached or the potential drops suddenly (indicating electrical breakdown of the coating). It is essential to return the potential to zero after each determination, and to maintain the transformer to test specimen contacts.

Carry out a minimum of five tests and record the lowest value obtained. Alternatively ascertain whether or not any value falls below a predetermined electrical breakdown potential.

5 Expression of results

Express the electric breakdown potential, in volts, as the lowest of the five values recorded.