BRITISH STANDARD

BS 6161 :
Part 18 : 1991

Methods of test for

Anodic oxidation coatings on aluminium and its alloys

Part 18. Determination of surface abrasion resistance

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Surface Coatings (other than Paints) Standards Policy Committee (SRC/-) to Technical Committee SRC/32, upon which the following bodies were represented:

Aluminium Federation
Aluminium Finishing Association
Aluminium Window Association
Association of Builders' Hardware Manufacturers
British Lock Manufacturers' Association
British Metal Finishing Suppliers' Association
Institute of Corrosion
Institute of Metal Finishing
Institution of Chemical Engineers
Metal Finishing Association
Metal Window Federation Ltd.

This British Standard, having been prepared under the direction of the Surface Coatings (other than Paints) Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 20 December 1991

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The following BSI references relate to the work on this standard:
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Contents

Foreword

This Part of BS 6161 has been prepared under the direction of the Surface Coatings (other than Paints) Standards Policy Committee.

At present the following Parts of this British Standard have been published:

Part 1 Determination of mass per unit area (surface density) of anodic oxidation coatings (gravimetric method)
Part 2 Determination of thickness of anodic oxide coatings: non-destructive measurement by split-beam microscope
Part 3 Assessment of sealing quality by measurement of the loss of mass after immersion in phosphoric-chromic acid solution
Part 4 Assessment of sealing quality by measurement of the loss of mass after immersion in acid solution
Part 5 Estimation of loss of absorptive power of sealed coatings: dye spot test with prior acid treatment
Part 6 Assessment of sealing quality by measurement of admittance or impedance
Part 7 Accelerated determination of light fastness of coloured anodic oxidation coatings using artificial light
Part 8 Determination of the fastness to ultraviolet light of coloured anodic oxide coatings
Part 9 Measurement of wear properties with an abrasive wheel wear test apparatus
Part 10 Measurement of mean specific abrasion resistance with an abrasive jet test apparatus
Part 11 Measurement of total reflectance using a photoelectric reflectometer
Part 12 Measurement of specular reflectance and specular gloss at angles of 20°, 45°, 60° or 85°
Part 13 Image clarity test using the Gardam grid
Part 14 Determination of infra-red reflectance
Part 15 Determination of electrical breakdown potential
Part 16 Rating system for the evaluation of pitting corrosion — Chart method
Part 17 Rating system for the evaluation of pitting corrosion — Grid method
Part 18 Determination of surface abrasion resistance

Further Parts of this standard will be prepared, if required.

This Part describes a method of test only and should not be used or quoted as a specification defining abrasion resistance. Reference to this Part should state that the method of test is in accordance with the appropriate method(s) of BS 6161 : Part 18.

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Method

1 Scope

This Part of BS 6161 describes a method of test for the determination of the surface abrasion resistance of anodic oxidation coatings produced either by sulphuric acid anodizing or by integral colour anodizing (in solutions containing high proportions of organic acids) on aluminium and its alloys. It is mainly intended for the evaluation of external architectural coatings.

Whole articles can be used for this test and, for those passing the test, it is non-destructive.

NOTE 1. The abrasive wheel test and the abrasive jet test described in BS 6161 : Parts 9 and 10 respectively are, in contrast, destructive of the coating and often of the article.

NOTE 2. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 6161, the following definitions apply.

2.1 double stroke

One passage backwards and forwards across the test area on the test sample.

2.2 test specimen

The specimen on which the anodic oxidation coating is to be evaluated.

2.3 block

Resilient support for the abrasive paper during the test.

3 Principle

The surface abrasion resistance is evaluated by using abrasive papers to determine whether or not the coating is harder than the abrasive papers used.

4 Apparatus

4.1 *Glass coated paper*, grade 00 (very fine), as specified in BS 871, strips 12 mm wide and 150 mm to 200 mm long.

4.2 *Garnet coated paper*, 'A' weight, grade no. 220, as specified in BS 871, strips 12 mm wide and 150 mm to 200 mm long.

NOTE. The hardness of the abrasives on Mohs' scale are: glass 4.0 to 4.5 and garnet 6.5 to 6.8.

4.3 *Resilient support for the paper during the test*, 6 mm to 8 mm thick and approximately 30 mm wide and 40 mm long. The hardness of the block shall be 30 IRHD to 70 IRHD (international rubber hardness degrees) as measured using the method described in BS 903 : Part A26.

NOTE. A large rectangular rubber or soft plastics pencil eraser may be suitable.

5 Procedure

5.1 Test specimen

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

5.2 Method I

Wrap a strip of glass coated or garnet coated paper, as appropriate, round the block, so that the abrasive side lies outwards, across the 6 mm to 8 mm thickness of the block and so that the ends of the strip may be held firmly in place by the thumb and forefinger on either side of the block (figure 1(a)). Position the strip so that it lies across the leading end of the block, as it is held (figure 1(b)).

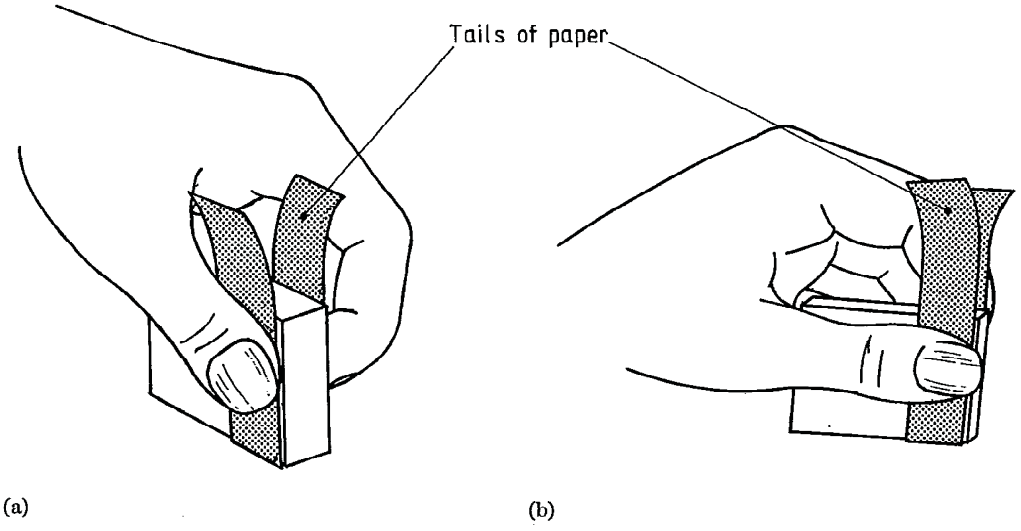

Figure 1. Position of abrasive paper on block

Glass coated paper shall be used for a coating produced by sulphuric acid anodizing.

Garnet coated paper shall be used for a coating produced by integral colour anodizing.

Press the abrasive strip, backed by the block, against the anodic oxide surface and, applying a firm pressure, make 10 double strokes with an amplitude of 25 mm to 30 mm, keeping to the same track along the surface. After 10 double strokes, lift the block and examine that part of the abrasive paper which has been in contact with the anodic oxidation coating.

A dense deposit of chalky white powder on the abrasive surface of the paper, abraded from the anodic oxidation coating, indicates that the coating is softer than the abrasive; no deposit indicates that a coating is harder than the abrasive.

NOTE. An anodic oxidation coating abraded by glass coated paper will have a wear index greater than 1.4, when measured by the abrasive wheel wear test described in BS 6161 : Part 9. An anodic oxidation coating abraded by garnet coated paper will have a wear index of greater than 0.9 when measured by the same test.

A light deposit of powder, not filling completely all the spaces between the abrasive particles, can indicate the removal of a very thin superficial sealing bloom. If in doubt, wipe clean the test area with a clean, dry cloth, locate a fresh area of abrasive paper over the edge of the block and repeat the test on the same test area. A dense chalky powder deposit on the abrasive paper indicates an anodic oxidation coating softer than the abrasive; no deposit indicates a coating harder than the abrasive.

If in doubt, to confirm that the anodic oxidation coating is softer than the abrasive use method II (see **5.3**).

5.3 Method II

Test as above in method I making 50 double strokes, providing a fresh area of abrasive paper after every 10 double strokes. After completion of the abrasion, measure the anodic oxidation coating thickness in the centre of the abraded track using an eddy current gauge as described in BS 5411 : Part 3 and compare the value obtained with that for the unabraded coating adjacent to the wear track. A loss of more than 2 μm indicates that the coating is softer than the abrasive.

NOTE. The abraded site may appear to gain thickness if the anodic oxide coating is harder than the abrasive due to the abrasive being transferred from the paper to the test site.

6 Test report

The test report shall include the following information:

(a) identification of the test specimen;

(b) a reference to the method used;

(c) the abrasive paper used;

(d) the location of the test area on the test surface;

(e) the result of the test;

(f) the date of the test.

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Publication(s) referred to

BS 871	Specification for abrasive papers and cloths
BS 903	Methods of testing vulcanized rubber Part A26 Determination of hardness
BS 5411	Methods of test for metallic and related coatings Part 3 Eddy current method for measurement of coating thickness of non-conductive coatings on non-magnetic basis metals
BS 6161	Methods of test for anodic oxidation coatings on aluminium and its alloys Part 9 Measurement of wear properties with an abrasive wheel wear test apparatus Part 10 Measurement of mean specific abrasion resistance with an abrasive jet test apparatus

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