INTERNATIONAL STANDARD 3211

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Anodizing of aluminium and its alloys — Assessment of resistance of anodic coatings to cracking by deformation

Anodisation de l'aluminium et de ses alliages — Évaluation de la résistance des couches anodiques à la formation de criques par déformation

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FOREWORD

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Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3211 was drawn up by Technical Committee ISO/TC 79, *Light metals and their alloys,* and circulated to the Member Bodies in July 1973.

It has been approved by the Member Bodies of the following countries :

Australia	Germany	Romania
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Belgium	India	Spain
Bulgaria	Ireland	Sweden
Chile	Israel	Thailand
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France	Poland	

The Member Body of the following country expressed disapproval of the document on technical grounds :

Canada

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Anodizing of aluminium and its alloys — Assessment of resistance of anodic coatings to cracking by deformation

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a practical method for assessing the resistance of anodic coatings to cracking by deformation which these coatings may undergo.

This method is applicable particularly to sheet with thin oxide coatings (thickness less than 5 μm).

2 PRINCIPLE

Bending of the test piece along a spiral, graduated with a radius-of-curvature index, using a simple instrument.

Determination of the radius of curvature corresponding to the region where the first cracks in the oxide layer appear.

Calculation of the percentage elongation of the test piece corresponding to this radius of curvature.

3 APPARATUS

Measuring instrument, as shown in the figure, which includes :

a) **Screw** for clamping one end of the test piece;

b) **Metallic former,** mounted on a wooden base, in the shape of a spiral graduated in indexes from 1 to 18. These indexes correspond to radii of curvature which are given by the formula

$$\text{Radius} = 21 - \text{Index}$$

and shown in the following table :

Index E	Radius of curvature, R cm	Index E	Radius of curvature, R cm
1	20	10	11
2	19	11	10
3	18	12	9
4	17	13	8
5	16	14	7
6	15	15	6
7	14	16	5
8	13	17	4
9	12	18	3

4 PROCEDURE

4.1 Test piece

Take a strip of anodized aluminium having approximately the following dimensions :

- length : 25 cm
- width : 2 cm
- maximum thickness : 0,5 cm

4.2 Determination

Clamp one end of the test piece with the clamping screw with significant surface outward.

Bend the test piece progressively over the spiral in such a way that the test piece remains in contact with the spiral.

Mark the region where the first cracks appear in the anodic coating.

If the cracks are difficult to detect, they can be rendered visible by immersing the bent test piece for 5 min in a solution at 20 °C with the following composition (according to ISO/R 2085, *Surface treatment of metals — Anodization of aluminium and its alloys — Check of continuity of thin coatings — Copper sulphate test*) :

- copper sulphate : 20 g
- hydrochloric acid, ρ 1,18 g/ml : 20 ml
- distilled water : 1 000 ml

Replace the test piece on the apparatus. Note the index corresponding to the region where the first cracks appear.

5 EXPRESSION OF RESULTS

The percentage elongation A of the anodized metal is given by the formula :

$$A\ \% = \frac{100\,a}{2R + a}$$

where

a is the thickness, in centimetres, of the test piece;