



**International
Standard**

ISO 2135

**Anodizing of aluminium and its
alloys — Accelerated test of light
fastness of coloured anodic oxidation
coatings using artificial light**

*Anodisation de l'aluminium et de ses alliages — Essai accéléré de
solidité à la lumière artificielle des couches anodiques colorées*

**Fifth edition
2024-10**

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 2, *Organic and anodic oxidation coatings on aluminium*.

This fifth edition cancels and replaces the fourth edition (ISO 2135:2017), which has been technically revised.

The main changes are as follows:

- the procedural description in [Clause 4](#) has been moved to [7.3](#);
- the terms for representing European blue wool reference material have been unified into "blue wool reference material";
- the term "light fastness number" has been specified in [3.1](#);
- the apparatus listed in the procedures have been added in [Clause 5](#);
- the period of exposure for instrumental assessment has been specified.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Anodizing of aluminium and its alloys — Accelerated test of light fastness of coloured anodic oxidation coatings using artificial light

1 Scope

This document specifies an accelerated test method for assessing the fastness, using artificial light, of coloured anodic oxidation coatings on aluminium and its alloys.

For evaluating light fastness on exterior exposure, only outdoor exposure under conditions comparable with actual service is completely satisfactory.

Accelerated testing is suitable as a quality-control test of coloured anodic oxidation coatings whose light fastness number has already been established by means of outdoor exposure testing.

The method is applicable to coloured anodic oxidation coatings on aluminium and its alloys produced by any means and for any purpose.

However, the method is not suitable for the measurement of coloured coatings with a light fastness number already established by means of outdoor exposure testing and of less than 6.

The outdoor exposure test is described in ISO 105-B01.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

ISO 105-B01, *Textiles — Tests for colour fastness — Part B01: Colour fastness to light: Daylight*

ISO 105-B02, *Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test*

ISO 4582, *Plastics — Determination of changes in colour and variations in properties after exposure to glass-filtered solar radiation, natural weathering or laboratory radiation sources*

ISO 7583, *Anodizing of aluminium and its alloys — Terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7583 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 light fastness number

function of the number of exposure cycles required to produce the change in colour corresponding to grade 3 of the grey scale

Note 1 to entry: The exposure cycle is the time of exposure which is determined using the blue wool reference material 6 described in ISO 105-B02 to show a change in colour corresponding to grade 3 of the grey scale.

4 Principle

Expose coloured anodic oxidation coatings to artificial light. Observe any changes in colour regularly by visual assessment (see [7.3.1](#)) or instrumental assessment (see [7.3.2](#)).

5 Apparatus

5.1 Exposure devices

For tests in artificial light, there are several types of exposure device that fulfil the conditions stipulated in this document (see [7.2](#)).

Suitable light sources shall be provided by a xenon-arc lamp, open-frame carbon-arc lamp or enclosed carbon-arc lamp (the specifications of which shall be in accordance with [Annex A](#)).

5.2 Blue wool reference materials 1 to 8, in accordance with ISO 105-B02.

5.3 Grey scale for assessing change in colour, in accordance with ISO 105-A02.

5.4 Opaque cardboard, in accordance with ISO 105-B01.

6 Test specimen

6.1 Sampling

The test specimen shall be taken from a significant flat surface of the product and shall not be taken from part of the edge because of possible distortion and/or non-uniformity.

Where it is impossible to test the product itself, a test specimen may be used. However, in this case, the test specimen used shall be representative of the product: it shall be made from the same material and prepared under the same conditions of finishing as those used for the preparation of the product.

The aluminium alloy, the manufacturing conditions (kind and temper of the material) and the surface condition before treatment shall be the same as those of the product.

Pre-treatment, anodizing, colouring and sealing shall be performed in the same baths and under the same conditions as the treatment of the product.

6.2 Size

The standard size of the test specimen should be about 150 mm × 70 mm. Other sizes may be used based on agreement between the interested parties.

6.3 Treatment before testing

The test specimen shall be clean and free from dirt, stains and other foreign matter. Any deposits or stains shall be removed with a clean, soft cloth or similar material which is wetted by water or an appropriate

organic solvent such as ethanol. Organic solvents which can corrode the test specimens or generate protective films on the test specimens shall not be used.

7 Procedure

7.1 Preparation of test specimen

In order to detect the changes in colour, partly cover the exposed surface of the test specimen by means of a piece of opaque cardboard. After exposure, take out the test specimen and remove the opaque cardboard to determine the change in colour.

7.2 Exposure conditions

Expose the test specimens in such a way that they are equidistant from the light source, around which they revolve slowly in order to ensure an identical distribution of light on each test specimen. If a flat bed type exposure device is used, this can be done by relocating test specimens.

Throughout the test, ensure that the temperature of the black panel is (63 ± 3) °C. A temperature of (50 ± 3) °C or another for the black panel may be used based on agreement between the interested parties.

NOTE The tolerances given are the allowable operational fluctuations, which are defined as the positive and negative deviations from the setting of the sensor at the operational control set point during equilibrium conditions. This does not mean that the set value varies by plus/minus the amount indicated from the given value.

Ensure that the procedure conforms to any instructions given by the manufacturer of the exposure device.

7.3 Period of exposure

7.3.1 For visual assessment

The exposure device and light source are first calibrated by exposing the blue wool reference material 6. The time of exposure is determined for these references to show the change in colour corresponding to grade 3 of the grey scale (about 25 % loss of colour). This length of time is defined as the exposure cycle for the exposure device (see 8.2.2, NOTE).

Coloured anodized test specimens of unknown light fastness are then exposed under the same conditions as the blue wool reference materials until they also show the change in colour corresponding to grade 3 of the grey scale. The number of exposure cycles required to produce this colour deterioration is used to assign the light fastness numbers of the specimens tested (see 8.2).

After calibrating the exposure device, test the test specimens for several exposure cycles until they show the change in colour corresponding to grade 3 of the grey scale (about 25 % loss of colour). Record the number of exposure cycles required to produce this change in colour.

The exposure cycle time for any given exposure device remains constant if:

- the emission of light is constant (i.e. constant intensity of radiation),
- the temperature is constant,
- the distance between the light source and the test specimens is constant,
- the ambient conditions (e.g. humidity) are constant.

In general, these conditions are not held over a long period of time. It is therefore necessary to redetermine the exposure cycle period from time to time.

7.3.2 For instrumental assessment

When the results are expressed from an instrumental assessment (see 8.3), the number of exposure cycles is determined by agreement between the interested parties.

8 Expression of results

8.1 General

The results should be expressed by visual assessment (see 8.2) or instrumental assessment (see 8.3).

8.2 Visual assessment

8.2.1 The light fastness number is indicated in Table 1.

Table 1 — Light fastness number as a function of the number of exposure cycles

Number of exposure cycles to fade anodized test specimen to grade 3 of the grey scale	Light fastness number
1	6
2 to 3	7
4 to 7	8
8 to 15	9
16	10
over 16	greater than 10

8.2.2 To avoid differences in the performance of the blue wool reference material 6 from different manufacturers, the references used should always come from the same manufacturer, if possible.

NOTE Typical exposure cycle times of the blue wool reference material 6 with exposure device designed for this test are about 300 h with a xenon-arc lamp (see ISO 105-B02) and 150 h with a carbon-arc lamp.

8.3 Instrumental assessment

The colour difference between exposed and masked parts shall be determined by the colour meter in ISO 4582, expressed by ΔE^* . If required, the gloss retention in ISO 7668 is determined. If the opaque cardboard is not used, the colour difference and the gloss retention shall be determined before and after the exposure of the test specimen.

9 Test report

The test report shall contain at least the following information:

- a reference to this document, i.e. ISO 2135: 2024;
- the type, application and identification of the product tested;
- the specification of the material used;
- the type of finishing treatment used;
- the type of light source used (xenon-arc lamp or carbon-arc lamp, either open-frame or enclosed);
- the results of the test (see Clause 8);
- any deviation, by agreement or otherwise, from the procedure specified;

- h) any unusual features observed;
- i) the date of the test.

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