INTERNATIONAL STANDARD

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Second edition
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Anodizing of aluminium and its alloys — Measurement of reflectance characteristics of aluminium surfaces using a goniophotometer or an abridged goniophotometer

Anodisation de l'aluminium et de ses alliages — Mesurage des caractéristiques de réflectivité des surfaces d'aluminium à l'aide d'un goniophotomètre normal ou simplifié

Reference number
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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 7759 was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*, Subcommittee SC 2, *Organic and anodic oxidation coatings on aluminium*.

This second edition cancels and replaces the first edition (ISO 7759:1983), which has been technically revised.

Introduction

The visual appearance of metallic finishes is important commercially on metals for automotive, architectural, and other uses where these metals undergo special finishing processes to produce the desired appearance. For end-products which use such finished metals, it is important that parts placed together have the same appearance. Specular reflectance is one of the properties measured, but additional measurements are usually required to identify adequately the appearance of any metal surface. In the method described in this International Standard, several important aspects of surface appearance are identified and can be measured. Those surfaces having identical sets of numbers will normally have the same reflectance characteristics and the same appearance (see References [1], [2] and [3]).

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1 Scope

This International Standard specifies a method for the measurement of the reflectance characteristics of high-gloss anodized aluminium surfaces.

The method described is also suitable for the measurement of the reflectance characteristics of other high-gloss metal surfaces.

The method is not suitable for diffuse-finish metal surfaces and does not measure colour.

2 Normative references

The following referenced documents are indispensable for the application 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.

CIE 38:1977, *Radiometric and Photometric Characteristics of Materials and their Measurement*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
goniophotometer
instrument in which specimens can be illuminated at selected angles of incidence and in which the light reflected in different directions can be measured

3.2
abridged goniophotometer
goniophotometer having a fixed angle of incidence and specific fixed direction(s) at which light reflected from the specimen is measured

NOTE The instrument described in this International Standard uses an angle of incidence of 30° and directions for measurement of reflected light of –30°, –30° ± 0,3°, –30° ± 2°, –30° ± 5°, and –45°, although some suitable instruments can be measured only on one side of the 30° angle.

4 Principle

4.1 The visual appearance of an anodized aluminium surface is characterised by means of six different properties (see 4.2 to 4.7) of the reflected light coming from a narrow-source beam incident on the surface at an angle of 30°.

4.2 Specular reflectance, R_s, is measured at 30° to the specimen normal using narrow source and receiver field angles (0,50° wide, maximum in the plane of the angle of reflection).

4.3 Distinctness of reflected image, R_i, is determined from the slightly off-specular reflectance ($R_{30 \pm 0,3}$) measured at 29,7° and 30,3°, the instrument integrating the light received from both of these apertures.

4.4 Narrow-angle haze, H_n, is determined from reflectance measurements taken at angles of 28° or 32° or both, i.e. at 2° away from the specular beam ($R_{30 \pm 2}$).

4.5 Wide-angle haze, H_w, is determined from reflectance measurements taken at angles of 25° or 35° or both, i.e. 5° away from the specular beam ($R_{30 \pm 5}$).

4.6 Diffuseness, R_d, is determined from a reflectance measurement taken at an angle of 45°, i.e.15° away from the specular beam (R_{45}).

4.7 Directionality, D_h, of the surface, derived from the ratio of two measurements of the narrow-angle haze, H_n, the first taken when the incident light is perpendicular to the direction of the surface texture and the second when the incident light is parallel to the surface texture, i.e. the rolling, extrusion or machining direction.

5 Apparatus

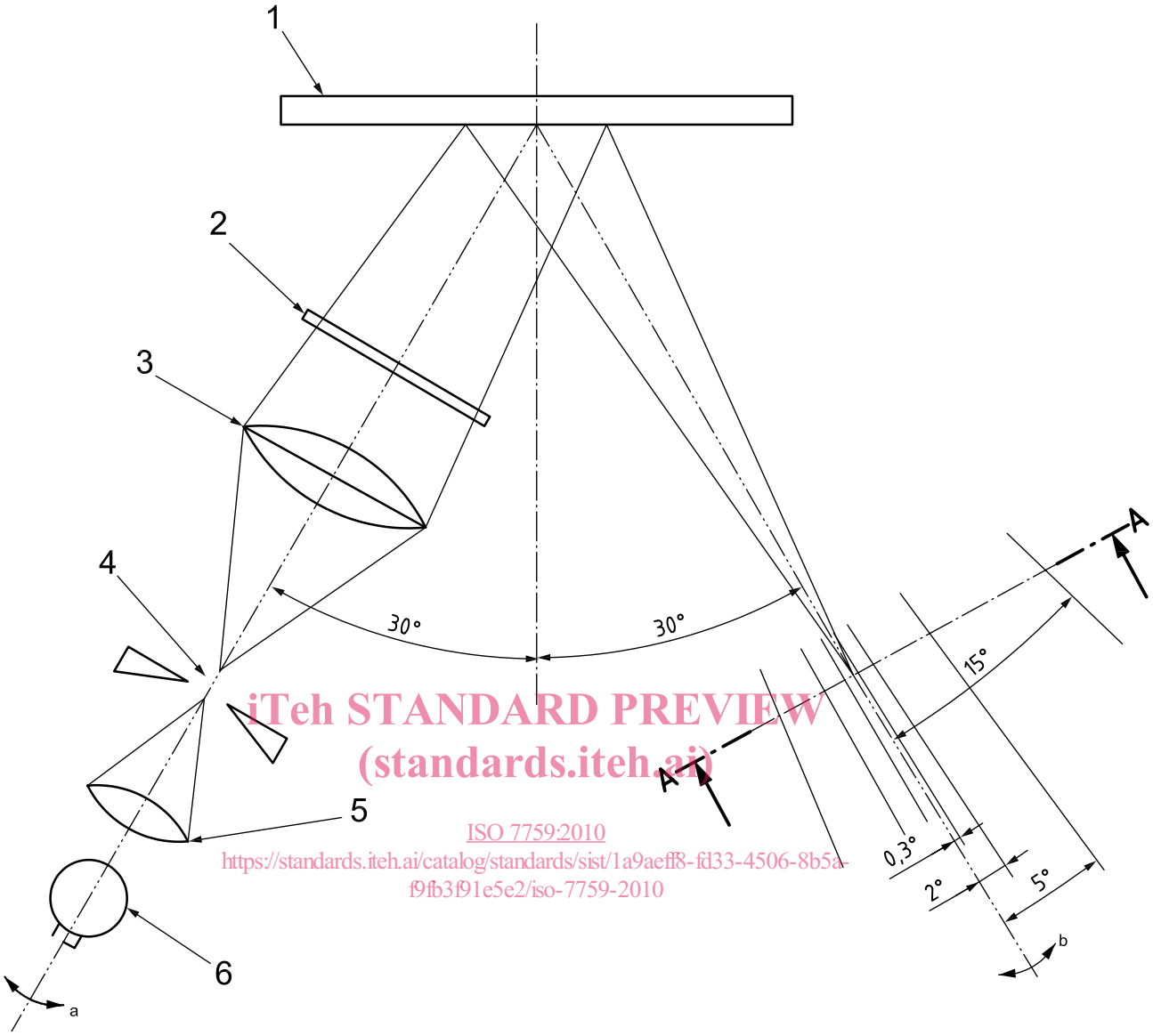
5.1 **Goniophotometer** or **abridged goniophotometer**, see Figures 1 and 2, capable of achieving the specific beam and field angles given in Table 1. The voltage regulation of the instrument shall be set to ±0,01 %.

NOTE Details of the precision and accuracy of goniophotometers are given in Annex A.

Table 1 — Dimensions of the mirror image of the source-slit, and of the receiver windows measured in the same plane (see Figures 1 and 2)

Values in degrees

Parameter	Source-slit mirror image	Specular receiver window	Distinctness-of-image receiver window	Haze receiver windows		Diffuseness receiver window
Angle of centre of window (measured from perpendicular to specimen surface)	30,0 ± 0,4	30,0 ± 0,4	30,30 ± 0,04 and 29,70 ± 0,04	28,0 ± 0,4 and 32,0 ± 0,4	25,0 ± 0,4 and 35,0 ± 0,4	45,0 ± 0,4
Width (in the plane of the angle of reflection)	0,44 ± 0,01	0,40 ± 0,01	0, 14 ± 0,01	0,4 ± 0,1	0,5 ± 0,1	2,0 ± 0,2
Length (across the plane of the angle of reflection)	5,0 ± 1,0	3,0 ± 1,0	3,0 ± 1,0	3,0 ± 1,0	3,0 ± 1,0	3,0 ± 1,0



Key

1 test piece
2 neutral density filter (for high-specularity materials)
3 source object lens
4 source slit
5 condenser lens
6 lamp

a Source-arm centre-line adjustment for maximum peak (optional).

b Receiver-window array centre-line adjustment for maximum peak (optional).

Figure 1 — Optical diagram of a typical abridged goniophotometer: general geometry of measurement (angles not to scale)