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BSI Standards Publication

Furniture — Assessment of the surface reflectance

bsi.

National foreword

This British Standard is the UK implementation of EN 13721:2023. It supersedes BS EN 13721:2004, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FW/0, Furniture.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Furniture - Assessment of the surface reflectance

Ameublement - Évaluation de la luminance lumineuse des surfaces

Möbel - Bewertung des Oberflächenreflexionsgrades

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European foreword

This document (EN 13721:2023) has been prepared by Technical Committee CEN/TC 207 “Furniture”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by October 2023, and conflicting national standards shall be withdrawn at the latest by October 2023.

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

This document supersedes EN 13721:2004.

The main changes compared to the previous edition are listed below:

— revised scope: test method is not applicable to some metallic paints and pearly coatings;

— normative references updated;

— additional terms and definitions “final inspection”, “colorants control” added;

— revised Table 1 Recommended measurement geometries;

— additional 7.2 Conditioning chamber and 7.3 Cleaning cloth added;

— document editorially revised in its entirety.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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1 Scope

This document specifies a method for the assessment of the surface reflectance of furniture surfaces and relates to rigid surfaces of all finished products regardless of materials, except for finishes on leather and fabrics, which are excluded from this document.

This document is applicable to the test, intended to be carried out on finished furniture, but can be carried out on test panels of the same material, finished in an identical manner to the finished product, and of a size sufficient to meet the requirements of the test.

The test method is not applicable to some metallic paints and pearly coatings.

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.

EN ISO/CIE 11664-1:2019, *Colorimetry - Part 1: CIE standard colorimetric observers (ISO/CIE 11664-1:2019)*

EN ISO/CIE 11664-2, *Colorimetry - Part 2: CIE standard illuminants (ISO/CIE 11664-2)*

EN ISO/CIE 11664-3, *Colorimetry - Part 3: CIE tristimulus values (ISO/CIE 11664-3)*

EN ISO 18314-1:2018, *Analytical colorimetry - Part 1: Practical colour measurement (ISO 18314-1:2015)*

CIE 1931, *Standard colorimetric colour coordinates*

CIE 1964, *Colorimetry, CIE Standard Recommendations*

3 Terms and definitions

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

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

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
reflectance
ratio of the radiant flux reflected in the directions within a given cone to that reflected in the same directions by a perfect reflecting diffuser identically irradiated in the observed wavelength interval (spectral reflectance factor $R(\lambda)$ in EN ISO/CIE 11664-3)

3.2
trichromatic compound
lightness factor
Y
value given by the equation in Clause 10 of this document

3.3
test unit
finished item of furniture

3.4
test surface
part of the test unit, where the test area is included

3.5
test panel
panel produced in the same way as the test surface

Note 1 to entry: The test panel shall be used when it is not possible to carry out the test directly on the test surface.

3.6
test area
area under the equipment, where the measurement is carried out

3.7
pearly coatings
coatings with pearly additives, acting like microscopic mirrors reflecting and transferring the light in several directions

3.8
final inspection
assessment focusing on correlation to visual appearance

3.9
colorants control
assessment independent of surface differences

4 Principle

This document is based on the reflectance measurement or on the related value, measured as the trichromatic compound or lightness factor, *Y*.

The reflectance of the test unit/test panel shall be measured by a photometric equipment, capable of illuminating the test area by a standardized illuminant and at a standardized angle of incidence. The response is received by a standardized observer. The lightness or trichromatic compound is calculated according to the equation given in Clause 10 of this document.

5 Viewing/illumination condition geometry

The geometry of measurement illumination/viewing shall be 45°/0° or d/8°.

For textured surfaces, a 45°/0° geometry is preferable.

The denomination of the measurement conditions of the different geometries is as in the following Table 1 (according to EN ISO 18314-1:2018, Table 1).

Table 1 — Recommended measurement geometries

Sample properties		Recommended measurement geometries	
Material	**Surface**	**Final inspection**	**Colorants control**
		Goal: correlation to visual perception	Goal: independence of surface differences
Paint: opaque and translucent	Mat	45°/0°	di/8°
	Silk mat	45°/0°	di/8°
	High gloss	45°/0°, de/8°	di/8°, (45°/0°, de/8°)
	Textured	45°/0°	di/8°
	Bronzing	45°/0°	
	Orange peel	45°/0°	di/8°
Paint: transparent on high gloss metal	High gloss	di/8°	di/8°
Paint: transparent on mat substrate	High gloss	45°/0°	di/8°
Paste: measurement through high gloss glass	Glass high gloss	45°/0°, de/8°	45°/0°, de/8°
d = diffuse; i = specular included; e = specular excluded NOTE Instead of 45°/0° geometry also 0°/45° geometry can be used.			

6 Standard colorimetric observer and standard illuminant

If geometry 45°/0° is used, the CIE 1931 supplementary standard colorimetric observer and standard illuminant D65, as specified in EN ISO/CIE 11664-1:2019 and EN ISO/CIE 11664-2, shall be used.

If geometry d/8° is used, the CIE 1964 supplementary standard colorimetric observer and standard illuminant D65, as specified in EN ISO/CIE 11664-1:2019 and EN ISO/CIE 11664-2, shall be used.

7 Equipment

7.1 General

For the tests, the following equipment may be used:

— Spectrophotometer as described in EN ISO 18314-1:2018; or

— Tristimulus colourimeter as described in EN ISO 18314-1:2018.

7.2 Conditioning chamber

A chamber with a standard atmosphere of (23 ± 2) °C and a relative humidity of (50 ± 5) °C.

7.3 Cleaning cloth

White, soft, absorbent cloth.

8 Preparation and conditioning of test units/test panels

The test unit/test panel shall be conditioned for not less than 24 h at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %.

The test unit/test panel shall be kept in a room without direct light exposure.

The test surface shall be cleaned with a soft, clean, lint-free cloth (see 7.3) before the test.

The test surface shall be substantially flat, and of sufficient size to take the measurements.

9 Instrument calibration

9.1 Calibration

Before carrying out any tests, calibrate the equipment according to EN ISO 18314-1:2018 or the instructions of the equipment manufacturer.

Calibration shall be carried out at the start of every period of operation and at intervals short enough to maintain equipment accuracy according to the manufacturer's instructions.

9.2 Reference scale

The reflectance scale, as recommended by the CIE, of the test surface, shall be in accordance with the perfect reflecting diffuser. The spectral reflectance of the perfect reflecting diffuser is unity for all wavelengths.

9.3 Reference standards (primary and working)

The reference standards (primary and working), shall be according to EN ISO 18314-1:2018.

10 Test Procedure

The equipment shall be operated in accordance with the manufacturer's instructions. After calibrating the equipment measure the value of the trichromatic compound or lightness factor, *Y*.

Y is the integrand of the supplementary spectral luminance efficiency function $\bar{y}\ (\lambda)$ (which emulates the response of the human eye to light for fields of angular subtense more than 4), with the light reflected from a surface $I(\lambda)\ R(\lambda)$. The value of *Y* is standardized so that where the surface is a perfectly reflecting diffuser (perfect white), it would be 100 %, and where the surface reflects no light (perfect black), it would be 0 %.

The value of *Y* is calculated using the following formula:

$$Y = \frac{\sum \bar{y}(\lambda) I(\lambda) R(\lambda) \Delta(\lambda)}{\sum \bar{y}(\lambda) I(\lambda) \Delta(\lambda)} \cdot 100\ \% \qquad (1)$$

where

$\bar{y}\ (\lambda)$ is the luminance efficiency function (given in EN ISO/CIE 11664-1:2019, Table 1 and Table 2 for every wavelength);

$I(\lambda)$ is the relative distribution of the energy spectrum for standardized illuminants;

$R(\lambda)$ is the reflectance;

$\Delta(\lambda)$ is the wavelength interval (given in EN ISO/CIE 11664-3).

Carry out the test at a temperature of (23 ± 2) °C.

Measurements on one surface shall be taken at nine different points. The mean value of the nine measurements shall be calculated.

If the spread of the nine single values exceeds 20 % of the mean value, the measurement shall be considered invalid and the procedure shall be repeated using three different points of the test surface. If the test result fails again, the lightness factor cannot be assessed.

NOTE The spread of the results can be reduced with a higher diameter, e.g. 20 mm.

11 Test report

The test report shall include at least the following information:

a) reference to this document, EN 13721:2023;

b) unit or panel tested, including relevant data (wherever possible the substrate, the finishing system and the finishing date shall be identified);

c) mean value of the nine measurements including the minimum and maximum values of *Y*;

d) type of instrument, the area measured, the geometry used and the illuminant (see Clause 7);

e) observer (2° or 10°);

f) any deviations from this document;

g) any unusual features observed;

h) name and address of the test facility;

i) date of test.

Bibliography

[1] Publication VIE 17.4 1984 (4th version) — International vocabulary for lighting (co-published by CIE and CEI)

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