BRITISH STANDARD

BS EN
13721:2004

Furniture — Assessment of the surface reflectance

The European Standard EN 13721:2004 has the status of a British Standard

ICS 97.140

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 9 and a back cover.

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EUROPEAN STANDARD

NORME EUROPÉENNE

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EN 13721

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English version

Furniture - Assessment of the surface reflectance

Meubles - Evaluation de la luminance lumineuse des surfaces

Möbel - Bewertung des Oberflächenreflexionsgrades

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Contents

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Foreword

This document (EN 13721:2004) 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of an identical text or by endorsement, at the latest by January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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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.

The test is 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 does not apply to extreme reflectances, i.e. below 15 % and above 75 %, because in the extreme reflectance range the results of the different measurement methods could deviate.

It is not applicable to some metallic paints and pearly coatings.

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.

ISO 7724-1:1984, *Paints and varnishes - Colorimetry Part 1: Principles*

ISO 7724-2, *Paints and varnishes – Colorimetry - Part 2: Colour measurement*

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.

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 (called spectral reflectance factor R (λ) in ISO 7724-1:1984)

3.2
trichromatic compound or 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

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3.5
test panel
panel produced in the same way as the test surface; it 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
coating with pearly additives. The pearly additives act like microscopy mirrors reflecting and transferring the light in several directions

4 Principle

This standard 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 standardised illuminant and at a standardised angle of incidence. The response is received by a standardised 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.

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

The denomination of the measurement conditions of the different geometries, are as in the following table (Table 4 of ISO 7724-1:1984).

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Table 1 — Denomination of the measurement conditions of the different geometries

Spectral radiometric characteristics		Measurement conditions		
	Symbol	**Illumination**	**Viewing**	**Designation (Abbreviation)**
Spectral reflectance factor	$R_{45/0}^{(\lambda)}$	directional $45^\circ \pm 5^\circ$	directional $0^\circ \pm 10^\circ$	45° / normal (45/0)
	$R_{0/45}^{(\lambda)}$	directional* $0^\circ \pm 10^\circ$	directional $45^\circ \pm 5^\circ$	normal/45° (0/45)
	$R_{d/8}^{(\lambda)}$	diffuse, integrating sphere	directional** $8^\circ \pm 2^\circ$	diffuse / 8° (d/8)
	$R_{(d)\ d/8}^{(\lambda)}$	diffuse, integrating sphere with gloss trap	directional** $8^\circ \pm 2^\circ$	diffuse / 8° (d/8) specular reflection excluded
Spectral reflectance	$\rho_{8/d}^{(\lambda)}$	directional** $8^\circ \pm 2^\circ$	diffuse, integrating sphere	8° / diffuse (8/d)
Spectral diffuse reflectance	$\rho_{(d)\ 8/d}^{(\lambda)}$	directional** $8^\circ \pm 2^\circ$	diffuse, integrating sphere with gloss trap	8° / diffuse (8/d) specular reflection excluded

* The possibility of interreflections between a high gloss specimen and the illuminating optics should be considered.

** This is contrary to the recommendations of the CIE (see CIE Publication No. 15) which permits the illumination or the viewing normal to the specimen (measurement conditions 0/d and d/0). The illumination or observation angle with a small defined deviation from zero as specified in ISO 7724-1 prevents interreflections between the specimen and the illumination or viewing optics when measuring high gloss specimens.

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 defined in ISO 7724-2, shall be used.

If geometry d/8 is used, the CIE 1964 supplementary standard colorimetric observer and Standard Illuminant D65, as defined in ISO 7724-2, shall be used.

7 Equipment

For the tests, the following equipment may be used:

Spectrophotometer as described in ISO 7724-2, or

Tristimulus colorimeter as described in ISO 7724-2, or

Abridged spectrophotometer as described in ISO 7724-2

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8 Preparation and conditioning of test units/test panels

The test unit/test panel shall be stored for not less than four weeks at a temperature not less than 15 °C and not more than 30 °C with free access of air.

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

Conditioning shall begin one week before testing and shall be carried out in air at a temperature of (23 ± 2) ° C and a relative humidity of (50 ± 5) %. The conditioning can be a part of the four weeks above.

The test surface shall be cleaned with a soft, clean, lint-free cloth 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 ISO 7724-2 or the instructions of the equipment manufacturers.

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 manufacturers 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 ISO 7724-2.

10 Test Procedure

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

Y is the integrand of the supplementary spectral luminance efficiency function $\bar{y}$ (λ) (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 (λ) R (λ). The value of Y is standardised 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:

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

Where:

$\bar{y}$ (λ): luminance efficiency function (given in Table 1 of ISO 7724-1:1984 for every wave length)

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I (λ): relative distribution of the energy spectrum for standardised illuminants

R (λ): reflectance

Measurements on one surface shall be taken at three different points, with three measurements at each point. 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.

11 Test report

The test report shall include at least the following information:

a) reference to this document;

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

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

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

e) observer (2° or 10°);

f) specular measurement including or excluding gloss;

g) any deviations from this document ;

h) name and address of the test facility;

i) date of test.

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

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