

BS EN 16268:2013



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Performance of reflecting surfaces for luminaires

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National foreword

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

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EN 16268

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English Version

Performance of reflecting surfaces for luminaires

Performance des surfaces réfléchissantes pour luminaires

Bewertung von Reflektoroberflächen für den Einsatz in
Leuchten

This European Standard was approved by CEN on 1 December 2012.

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Contents

Page

Foreword.....	3
1 Scope.....	4
2 Normative references.....	4
3 Terms and definitions	5
4 Measurement methods	6
4.1 General	6
4.2 Total reflectance ρ_{tot}	7
4.3 Diffuse reflectance ρ_{d}	8
4.4 Specular reflectance ρ_{r} , ρ_{rL} , ρ_{rT}	8
4.5 Colour	8
5 Durability test methods for evaluation of reflective materials based on maintained performance under different specified conditions	8
5.1 General	8
5.2 Temperature resistance	9
5.3 Humidity resistance	9
5.4 UV-Exposure resistance	9
5.5 Abrasion resistance	9
5.6 Scratch resistance	9
6 Classification.....	9
7 Assignment of Reflectance Class	10
8 Presentation of performance data.....	10
Annex A (normative) Measurement of total, diffuse and specular reflectance and colour.....	13
A.1 General	13
A.2 Measurement of total reflectance	13
A.3 Measurement of diffuse reflectance	16
A.4 Measurement of specular reflectance	16
Annex B (normative) Measurement of abrasion and scratch resistance.....	18
B.1 Measurement of abrasion and wipe resistance according to ISO 9211-4:2012.....	18
B.2 Measurement of scratch-resistance according to ISO 15184:2012.....	18
Annex C (informative) Further important properties of reflective materials.....	21
C.1 Cleaning.....	21
C.2 Solvent Resistance	21
Annex D (informative) Examples of structured surfaces.....	22
Bibliography.....	24

Foreword

This document (EN 16268:2013) has been prepared by Technical Committee CEN/TC 169 “Light and lighting”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by July 2013, and conflicting national standards shall be withdrawn at the latest by July 2013.

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1 Scope

This European standard is applicable to the optical performance of untreated or coated materials supplied in plane sheet or strip form for use as a plane or formed reflector as well as preformed reflectors both as originally produced and after prescribed tests to determine probable maintained performance in service. This includes:

a) untreated base materials, including:

- 1) aluminium,
- 2) steel,
- 3) plastic,
- 4) glass.

b) surface treated materials, including:

- 1) polished materials,
- 2) anodised materials,
- 3) vacuum metallised materials,
- 4) painted materials,
- 5) multilayer systems.

This European Standard is not applicable to fluorescent materials.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12665, *Light and lighting — Basic terms and criteria for specifying lighting requirements*

EN ISO 4892-3:2006, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 4892-3:2006)*

EN ISO 6270-2:2005, *Paints and varnishes — Determination of resistance to humidity — Part 2: Procedure for exposing test specimens in condensation-water atmospheres (ISO 6270-2:2005)*

ISO 7668, *Anodizing of aluminium and its alloys — Measurement of specular reflectance and specular gloss of anodic oxidation coatings at angles of 20 degrees, 45 degrees, 60 degrees or 85 degrees*

ISO 9211-4:2012, *Optics and photonics — Optical coatings — Part 4: Specific test methods*

ISO 15184:2012, *Paints and varnishes — Determination of film hardness by pencil test*

CIE 15.3:2004, *Colorimetry*

CIE 130:1998, *Practical methods for the measurement of reflectance and transmittance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12665, CIE 130:1998 and the following apply.

3.1

light reflecting surface of a luminaire

all reflecting surfaces of a luminaire with the main task of reflecting light and therefore with a total reflectance of at least 50 %

3.2

reflection

process by which radiation is returned by a surface or a medium, without change of frequency of its monochromatic components

3.3

total reflectance reflectance

ρ_{tot}
ratio of the whole reflected luminous flux to the incident flux:

$$\rho_{\text{tot}} = \phi_{\text{tot}} / \phi_i = \frac{\int_0^{\infty} S(\lambda) \cdot \rho(\lambda) \cdot V(\lambda) d\lambda}{\int_0^{\infty} S(\lambda) \cdot V(\lambda) d\lambda} \quad (1)$$

where

$\rho(\lambda)$ is the total spectral reflectance of the sample;

$S(\lambda)$ is the relative spectral power distribution of the incident radiation of standard illuminant A;

ϕ_{tot} is the total luminous flux reflected by the sample;

ϕ_i is the total incident luminous flux on the sample,

$V(\lambda)$ is the relative spectral weighting function of standard Observer at 2°.

3.4

diffuse reflectance

ρ_d
ratio of the diffuse reflected part of the reflected luminous flux to the incident flux:

$$\rho_d = \phi_d / \phi_i = \frac{\int_0^{\infty} S(\lambda) \cdot \rho_d(\lambda) \cdot V(\lambda) d\lambda}{\int_0^{\infty} S(\lambda) \cdot V(\lambda) d\lambda} \quad (2)$$

where

ρ_d is the diffuse spectral reflectance characteristic of the sample;

ϕ_d is the diffuse reflected luminous flux;

ϕ_i is the incident luminous flux;

$S(\lambda)$ is the relative spectral power distribution of the incident radiation of standard illuminant A;

$V(\lambda)$ is the relative spectral weighting function of standard Observer at 2°.

3.5 specular reflectance regular reflectance

ρ_r
reflection in accordance with the laws of geometrical optics, without diffusion, expressed as the ratio of the regular reflected part of the reflected luminous flux to the incident luminous flux:

$$\rho_r = \phi_r / \phi_i = \frac{\int_0^{\infty} S(\lambda) \cdot \rho_r(\lambda) \cdot V(\lambda) d\lambda}{\int_0^{\infty} S(\lambda) \cdot V(\lambda) d\lambda} \quad (3)$$

where

$\rho_r(\lambda)$ is the regular spectral reflectance characteristic of the sample;

ϕ_r is the specular reflected luminous flux;

ϕ_i is the incident luminous flux;

$S(\lambda)$ is the relative spectral power distribution of the incident radiation;

$V(\lambda)$ is the relative spectral weighting function of standard Observer at 2°.

3.6 reflectance class

performance classification for reflecting materials determined from the total reflectance and expressed as a character from A+ to H indicating decreasing reflectance efficiency

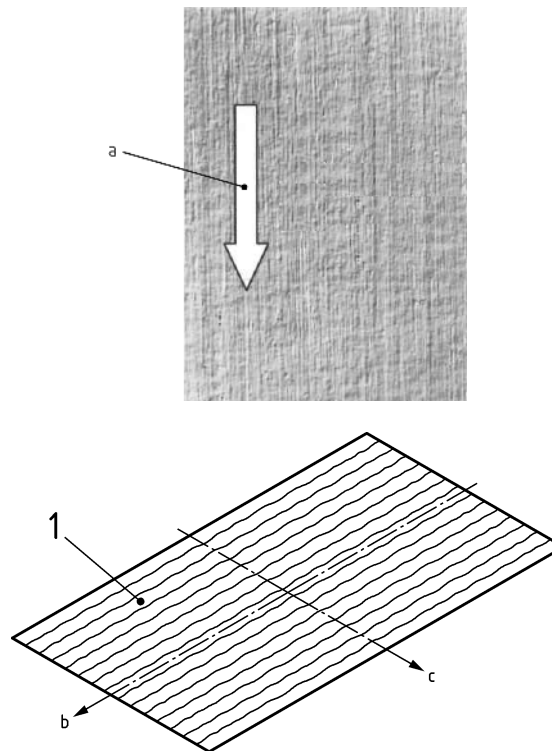
4 Measurement methods

4.1 General

The format of samples shall be plane and the minimum dimensions should be 100 mm x 100 mm.

For formed reflectors, a plane sample of the reflector should be taken or a plane sample of the same material should be produced in the same manner as the final reflector.

For materials manufactured by a linear process, measurements shall be made with the plane of incidence both parallel (i. e. longitudinal) to and perpendicular (i. e. transverse) to the linear process direction which shall be marked by the manufacturer on the samples, see Figure 1. The relevant symbols shall be marked by an index "L" for longitudinal direction and by "T" for transverse direction.



Key

- 1 sample
- a rolling direction
- b parallel direction
- c perpendicular direction

Figure 1 — Illustration of measurement parallel and perpendicular to the linear process direction

For embossed structured surfaces, the width of the illuminated area on the sample inside the sphere according to Annex A shall be at least three times larger than the dimension of the structure. Depending on the kind of structure, measurements in three or four directions shall be considered. In Annex D, examples of structure are illustrated.

NOTE Due to the undulating surface of embossed materials, good contact between the sample and the rim of the sample port cannot be maintained at all points. The resulting light leakage can cause the results of measurements made on these materials to be lower than their actual total reflectance values.

4.2 Total reflectance ρ_{tot}

The measurement shall be made in accordance with Annex A and documented.

For materials manufactured by a linear process, measurements shall be made with the plane of incidence both parallel to and perpendicular to the linear process direction (see Figure 1). For all other materials measurement shall be done in two perpendicular directions.

Five measurements in each of these directions on different areas of the materials are required.

The mean longitudinal value and the mean transverse value across all samples shall be calculated.

The total reflectance shall be the higher value of the mean values.

The uncertainty of the measurement process shall be documented, stating the percentage of uncertainty and the method by which the value was determined.