SLOVENSKI STANDARD
SIST EN 14500:2008

01-september-2008

Rolete in polokna - Toplotno in vizualno ugodje - Preskus in računske metode

Blinds and shutters - Thermal and visual comfort - Test and calculation methods

Abschlüsse - Thermischer und visueller Komfort - Prüf- und Berechnungsverfahren

Fermetures et stores - Confort thermique et lumineux - Méthodes d'essai et de calcul

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ICS:

91.060.50	Vrata in okna	Doors and windows

SIST EN 14500:2008 **en,fr,de**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14500

May 2008

ICS 91.060.50

English Version

Blinds and shutters - Thermal and visual comfort - Test and calculation methods

Fermetures et stores - Confort thermique et lumineux - Méthodes d'essai et de calcul

Abschlüsse - Thermischer und visueller Komfort - Prüf- und Berechnungsverfahren

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Contents

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SIST EN 14500:2008
https://standards.iteh.ai/catalog/standards/sist/652c8b9b-1ee8-45ac-9d47-e6a3eacb6855/sist-en-14500-2008

SIST EN 14500:2008

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https://standards.iteh.ai/catalog/standards/sist/f9b3b0b-1ee8-45ac-9d47-a6b0a1e85ba/sist-en-14500-2008

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Foreword

This document (EN 14500:2008) has been prepared by Technical Committee CEN/TC 33 “Doors, windows, shutters, building hardware and curtain walling”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by November 2008, and conflicting national standards shall be withdrawn at the latest by November 2008.

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

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Introduction

This European Standard is part of a series of standards dealing with blinds and shutters for buildings as defined in EN 12216.

This European Standard is mainly based on the European work performed in CEN/TC 89 "Thermal performance of buildings and building components" relating to solar and light transmittance of solar protection devices combined with glazing, and the document CIE 130.

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1 Scope

This European Standard defines test and calculation methods for the determination of the reflection and transmission characteristics to be used to determine the thermal and visual comfort performance classes of external blinds, internal blinds and shutters, as specified in EN 14501.

This European Standard also specifies the method to determine opacity characteristics of dim-out/black-out external blinds, internal blinds and shutters, as specified in EN 14501.

This European Standard applies to the whole range of shutters, awnings and blinds defined in EN 12216, described as solar protection devices in this European Standard. Some of the characteristics (e.g. g_{tot}) are not applicable when products are not parallel to the glazing (e.g. folding-arm awnings).

NOTE Informative Annex D presents an approach for the determination of characteristics in case of projectable products.

Products using fluorescent or retroreflecting materials are outside the scope of this European Standard.

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.

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

SIST EN 14500:2008

EN 410, *Glass in building – Determination of luminous and solar characteristics of glazing*

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EN 12216:2002, *Shutters, external blinds, internal blinds – Terminology, glossary and definitions*

EN 13363-1, *Solar protection devices combined with glazing – Calculation of solar and light transmittance – Part 1: Simplified method*

EN 13363-2:2005, *Solar protection devices combined with glazing – Calculation of total solar energy transmittance and light transmittance – Part 2: Detailed calculation method*

EN 14501:2005, *Blinds and Shutters – Thermal and visual comfort – Performance characteristics and classification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12216:2002, EN 14501:2005 and the following apply.

3.1 Processes

3.1.1
reflection
process by which radiation is returned by a surface or medium, without change of frequency of its monochromatic components

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The following sub-processes are defined herewith:

— Specular (or directional or regular) reflection: reflection in accordance with the laws of geometrical optics, without diffusion

— Diffuse reflection: reflection due to light scattering, in which, on the macroscopic scale, there is no specular reflection

— Direct-hemispherical (or mixed) reflection: partly specular and partly diffuse reflection. Direct-hemispherical reflection is the sum of the diffuse and specular reflection

— Isotropic diffuse reflection: diffuse reflection in which the spatial distribution of the reflected radiation is such that the radiance or luminance is the same in all directions in the hemisphere into which the radiation is reflected

3.1.2
transmission
passage of radiation through a medium without change of frequency of its monochromatic components

The following sub-processes are defined herewith:

— Directional (or direct-direct) transmission: transmission in accordance with the laws of geometrical optics, without diffusion or redirection

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— Diffuse transmission: transmission due to light scattering, in which, on the macroscopic scale, there is no direct transmission

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— Direct-hemispherical (or mixed or total) transmission: partly directional and partly diffuse transmission. The direct-hemispherical transmission is the sum of the diffuse and direct transmission

— Isotropic diffuse transmission: diffuse transmission in which the spatial distribution of the transmitted radiation is such that the radiance or luminance is the same in all directions in the hemisphere into which the radiation is transmitted

3.1.3
absorption
process by which radiant energy is converted to a different form of energy (e.g. heat) by interaction with matter

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3.2 Characteristics

3.2.1
reflectance
ρ
ratio of the reflected flux to the incident flux

The following sub-characteristics are defined:

— Directional-directional (or direct-direct) reflectance: ratio of the specularly reflected flux to the directional incident flux

— Directional-diffuse reflectance: ratio of the diffusely reflected flux to the directional incident flux

— Directional-hemispherical (or total) reflectance: ratio of the total reflected flux to the directional incident flux

— Diffuse-hemispherical reflectance: ratio of the total reflected flux to the ideally diffuse incident flux. Ideally diffuse irradiation means that the radiance or the luminance is equal for the whole hemisphere of the incident irradiation

3.2.2
transmittance
τ
ratio of the transmitted flux to the incident flux

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The following sub-characteristics are defined:

— Directional-directional transmittance: ratio of the directly transmitted flux to the directional incident flux

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— Directional-diffuse transmittance: ratio of the diffusely transmitted flux to the directional incident flux

— Directional-hemispherical transmittance: ratio of the total transmitted flux to the directional incident flux

— Diffuse-hemispherical transmittance: ratio of the total transmitted flux to the ideally diffuse incident flux. Ideally diffuse irradiation means that the radiance or the luminance is equal for the whole hemisphere of the incident irradiation

3.2.3
absorptance
α
ratio of the absorbed flux to the incident flux

3.3 Angle definitions

3.3.1 General

All the following angles are defined in a coordinate system which is fixed relative to the orientation of the solar protection device

3.3.2
angle of incidence
θ
angle between the normal to the plane of the solar protection device and the direction of the incident radiation (see Figure 1)

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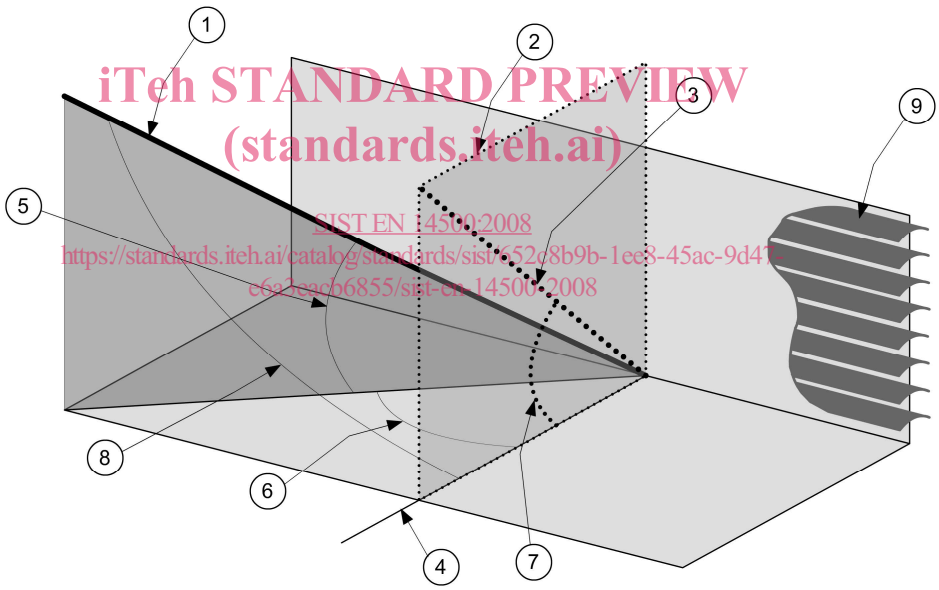
3.3.3
altitude angle
α_s
projection of the angle of incidence on the vertical plane which contains the direction of the incident radiation (see Figure 1)

3.3.4
azimuth angle
γ
projection of the angle of incidence on a plane which is normal to the plane of the solar protection device. The intersection of this projection plane and the plane of the solar protection device is horizontal (see Figure 1)

3.3.5
profile angle
α_p
projection of the altitude angle on a vertical plane which is perpendicular to the façade under consideration (see Figure 1). The profile angle is given by the following formula: $\text{tg}\ \alpha_p = \text{tg}\ \theta / \cos\ \gamma$



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Key

1 Direction of the incident radiation
2 Vertical plane normal to the solar protection device
3 Projected direction of the incident radiation
4 Direction normal to the solar protection device
5 Altitude angle (angle in the vertical plane)
6 Azimuth angle (angle in the horizontal plane)
7 Profile angle
8 Angle of incidence
9 Solar protection device

Figure 1 – Angle definitions

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4 Notations used

4.1 General

For the purpose of this document, the optical factors τ (transmittance), ρ (reflectance) and α (absorptance) are labelled with subscripts which indicate:

— The visual or solar properties;

— The geometry of the incident and the transmitted or reflected radiation.

4.2 Visual or solar properties

According to the respective spectrum, the following subscripts are used:

— « $_{e}$ » solar (energetic) characteristics, given for the total solar spectrum (wavelengths λ from 300 nm to 2 500 nm), according to EN 410;

— « $_{v}$ » visual characteristics, given for the standard illuminant D_{65} weighted with the sensitivity of the human eye (wavelengths λ from 380 nm to 780 nm), according to EN 410.

4.3 Geometry of the radiation

The following subscripts are used to indicate the geometry of the incident radiation and the geometry of the transmitted or reflected radiation (see Figure 2).

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— « $_{dir}$ » for directional (fixed, but arbitrary direction θ);

— « $_{n}$ » for normal, or near normal in case of reflected radiation, the angle of incidence is $\theta = 0°$, or $\theta \leq 8°$ respectively;

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— « $_{h}$ » for hemispherical (collected in the half space behind the sample plane);

— « $_{dif}$ » for diffuse.

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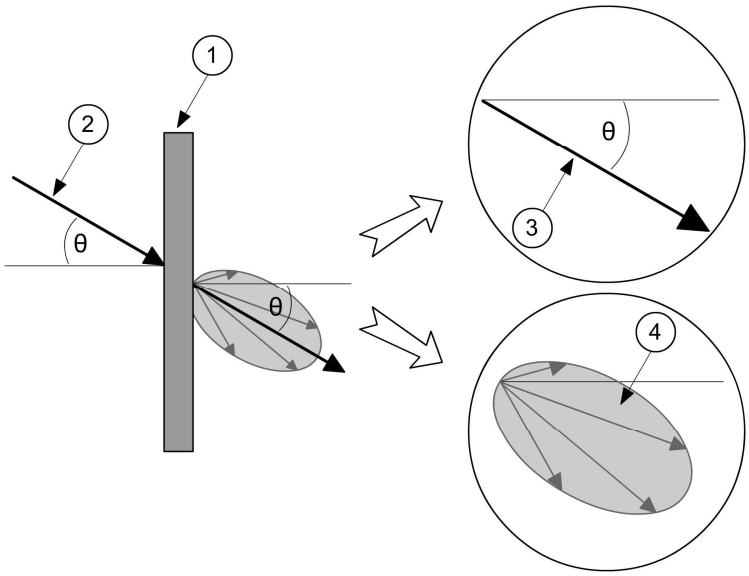

Key

1 Solar protection device
2 Incident directional light or solar radiation
3 Transmitted direct component of light or solar radiation
4 Transmitted diffuse component of light or solar radiation

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Figure 2 — Direct and diffuse components of transmitted radiation

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4.4 Optical factors

The optical factors are designated as follows:

— $\tau_{e,\ n\text{-}n}$ normal-normal solar transmittance

— $\tau_{v,\ n\text{-}n}$ normal-normal light transmittance

— $\tau_{v,\ n\text{-}dif}$ normal-diffuse light transmittance

— $\tau_{v,\ n\text{-}h}$ normal-hemispherical light transmittance

— $\tau_{v,\ dir\text{-}h}$ direct-hemispherical light transmittance

— $\tau_{e,\ n\text{-}h}$ normal-hemispherical solar transmittance

— $\tau_{e,\ dir\text{-}h}$ direct-hemispherical solar transmittance

— $\rho_{v,\ n\text{-}h}$ normal-hemispherical light reflectance

— $\rho_{v,\ dir\text{-}h}$ direct-hemispherical light reflectance

— $\rho_{e,\ n\text{-}h}$ normal-hemispherical solar reflectance

— $\rho_{e,\ dir\text{-}h}$ direct-hemispherical solar reflectance

— $\tau_{v,\ dif\text{-}h}$ diffuse-hemispherical light transmittance

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5 Test and calculation methods to be used according to product - Guidelines

5.1 General

The test methods described in this European Standard are intended to be used for testing the characteristics of the curtain elements of solar protection devices. Curtain elements are for example flat sheets of coated aluminium for slats for venetian blinds, fabric materials for roller blinds or glass slats with or without patterns for external glass venetian blinds. The properties of the whole product, which consists of one or more elements, are then calculated according to EN 13363-1 or EN 13363-2. Also a whole product may be tested, if the test equipment is sufficiently large so that the whole product fulfils the requirements of test samples as stated in Clause 6.3.

This European Standard characterises the product performance through the properties of the curtain (centre of product values). However, peripheral gaps and/or holes and the set-up can have a strong effect on the performance of the product under real conditions and shall be considered during set-up.

For all solar protection devices, it is assumed that the products are fully extended (not partially retracted) when solar protection or glare protection is required.

NOTE For building planning it can be useful to take into consideration partially retracted solar protection devices. The properties of the whole window can then be approximated from the properties of the window area with and without solar protection devices.

5.2 Venetian blinds

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The solar and light characteristics of venetian blinds shall be:

- Either measured directly on a complete product according to Clause 7. The venetian blind shall in this case fulfil the requirements of test samples specified in Clause 6.3;
- or calculated using the properties of the individual slats. The slats characteristics shall be measured according to Clause 7 and the calculation method of Annex A of EN 13363-2:2005 shall be used. Additional information/requirements presented in Clause 8 shall be used.

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NOTE If products cannot be appropriately characterised using EN 13363-2 (for example mirror finished and/or special shaped slats), a more detailed calculation method may be necessary.

The characteristics of the combination of a venetian blind with a glazing may be measured directly according to Clause 7 if the requirements of test sample specified in Clause 6.3 are fulfilled.

The different possibilities of determination of venetian blind characteristics are presented in Figure 3.

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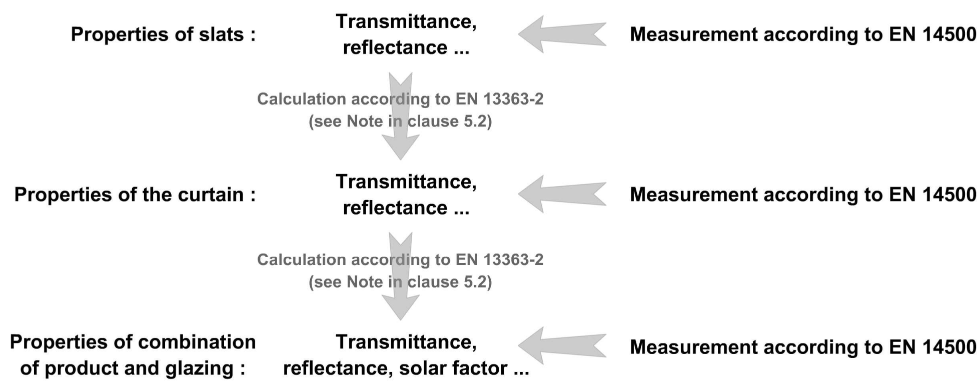
Properties of slats :
Transmittance, reflectance ...
Measurement according to EN 14500
Calculation according to EN 13363-2 (see Note in clause 5.2)
Properties of the curtain :
Transmittance, reflectance ...
Measurement according to EN 14500
Calculation according to EN 13363-2 (see Note in clause 5.2)
Properties of combination of product and glazing :
Transmittance, reflectance, solar factor ...
Measurement according to EN 14500

Figure 3 — Options for characterisation of venetian blinds

5.3 Roller blinds

The solar and light characteristics of roller blinds shall be:

— Either measured directly on a complete product according to Clause 7. The roller blind shall in this case fulfil the requirements of test sample specified in Clause 6.3;

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— Or determined using the properties of the fabric. In this case, it is assumed that the properties of the complete product are the same as those of the fabric.

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The characteristics of the combination of a roller blind with a glazing may be measured directly according to Clause 7 if the requirements of test samples specified in Clause 6.3 are fulfilled.

Opacity characteristics may be tested either on the curtain material or on a complete product if the test equipment is large enough. In all cases, it is essential to prevent any lateral losses through peripheral gaps.

The different possibilities of determination of roller blind characteristics are presented in Figure 4.

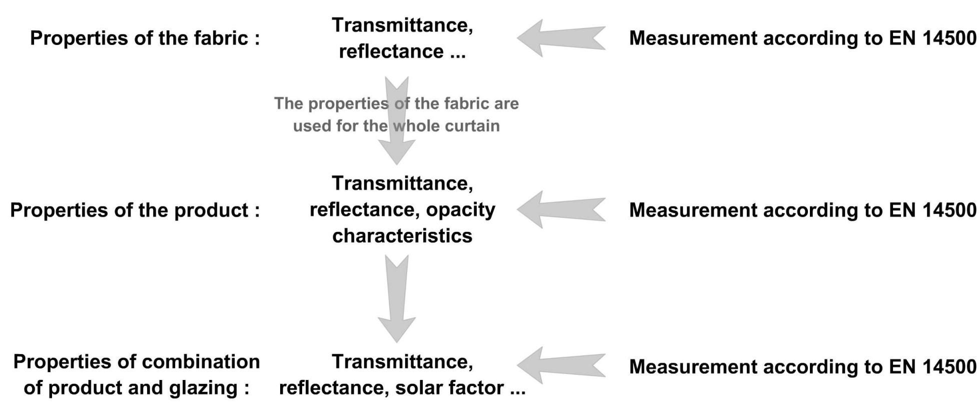
Properties of the fabric :
Transmittance, reflectance ...
Measurement according to EN 14500
The properties of the fabric are used for the whole curtain
Properties of the product :
Transmittance, reflectance, opacity characteristics
Measurement according to EN 14500
Properties of combination of product and glazing :
Transmittance, reflectance, solar factor ...
Measurement according to EN 14500

Figure 4 — Options for characterisation of roller blinds

5.4 Pleated blinds

As an approximation the properties of the fabric may be used as properties of the curtain in the same way as for roller blinds (see Clause 5.3).