SLOVENSKI STANDARD
SIST EN ISO 8599:2000

01-januar-2000

Optika in optiļ ni instrumenti - Kontaktne leļ e - Ugotavljanje spektralne in svetlobne prepustnosti (ISO 8599:1994)

Optics and optical instruments - Contact lenses - Determination of the spectral and luminous transmittance (ISO 8599:1994)

Optik und optische Instrumente - Kontaktlinsen - Bestimmung des spektralen Transmissionsgrades und des Lichttransmissionsgrades (ISO 8599:1994)

Optique et instruments d'optique - Lentilles de contact - Détermination du facteur spectral de transmission et du facteur relatif de transmission dans le visible (ISO 8599:1994)

Ta slovenski standard je istoveten z: EN ISO 8599:1996

ICS:

11.040.70	Oftalmološka oprema	Ophthalmic equipment

SIST EN ISO 8599:2000 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 8599

November 1996

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Descriptors: see ISO document

English version

Optics and optical instruments - Contact lenses - Determination of the spectral and luminous transmittance (ISO 8599:1994)

Optique et instruments d'optique - Lentilles de contact - Détermination du facteur spectral de transmission et du facteur relatif de transmission dans le visible (ISO 8599:1994)

Optik und optische Instrumente - Kontaktlinsen - Bestimmung des spektralen Transmissionsgrades und des Lichttransmissionsgrades (ISO 8599:1994)

This European Standard was approved by CEN on 1996-11-08. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Ref. No. EN ISO 8599:1996 E

Foreword

The text of the International Standard from ISO/TC 172 „Optics and optical instruments“ of the International Organization for Standardization (ISO) has been taken over as a European Standard by the Technical Committee CEN/TC 170 „Ophthalmic optics“, 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 May 1997, and conflicting national standards shall be withdrawn at the latest by May 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom

Endorsement notice

The text of the International Standard ISO 8599:1994 was approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 8599

First edition
1994-12-01

Optics and optical instruments — Contact lenses — Determination of the spectral and luminous transmittance

Optique et instruments d'optique — Lentilles de contact — Détermination du facteur spectral de transmission et du facteur relatif de transmission dans le visible

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 8599 was prepared by Technical Committee ISO/TC 172, *Optics and optical instruments*, Subcommittee SC 7, *Ophthalmic, endoscopic, metrological instruments and test methods.*

Annex A of this International Standard is for information only.

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Optics and optical instruments — Contact lenses — Determination of the spectral and luminous transmittance

1 Scope

This International Standard specifies a method for determining the spectral transmittance and the luminous transmittance of contact lenses.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 8320:1986, *Optics and optical instruments — Contact lenses — Vocabulary and symbols.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 8320 and the following definitions apply.

3.1 spectral transmittance, $\tau(\lambda)$**:** Ratio of the transmitted spectral radiant flux, $\Phi_{e\lambda\tau}$, to the incident spectral radiant flux, $\Phi_{e\lambda}$:

$$\tau(\lambda) = \frac{\Phi_{e\lambda\tau}}{\Phi_{e\lambda}} \qquad \ldots (1)$$

where

$$\Phi_{e\lambda} = \frac{d\Phi_e}{d\lambda}$$

$$\Phi_{e\lambda\tau} = \frac{d\Phi_{e\tau}}{d\lambda}$$

3.2 luminous transmittance, τ**:** Ratio of the transmitted luminous flux, Φ_τ, to the incident luminous flux, Φ:

$$\tau = \frac{\Phi_\tau}{\Phi}$$

$$= \frac{\int_{\lambda = 380\ \text{nm}}^{780\ \text{nm}} (\Phi_{e\lambda})_{rel}\, \tau(\lambda)\, V(\lambda)\, d\lambda}{\int_{\lambda = 380\ \text{nm}}^{780\ \text{nm}} (\Phi_{e\lambda})_{rel}\, V(\lambda)\, d\lambda} \qquad \ldots (2)$$

4 Principle

4.1 Spectral transmittance

In practice, the measurement of the spectral transmittance, $\tau(\lambda)$, is taken over a small range of wavelength $\Delta\lambda$, for which the associated radiant flux $\Delta\Phi_e$ is given by $\Delta\Phi_e = \Phi_{e\lambda}\Delta\lambda$. In order to determine the spectral transmittance, $\tau(\lambda)$, the radiant flux relative to the wavelength both with and without the contact lens is measured and $\tau(\lambda)$ calculated from equation (1).

4.2 Luminous transmittance

In the case of luminous transmittance, the relative spectral luminous efficiency, $V(\lambda)$, of the human eye is the criterion for the assessment of the radiation.

The value of Φ is always dependent upon the relative spectral distribution of the radiator used (illuminant), which is given by $(\Phi_{e\lambda})_{rel}$. For this reason, the standard illuminant has to be indicated.

The luminous transmittance, τ, is determined from spectral transmittance values $\tau(\lambda)$ using equation (2). The luminous transmittance, τ, can also be measured with a receiver simulating the relative spectral luminous efficiency, $V(\lambda)$, of the human eye. In this case, standard illuminant A has to be used.

If the instrument used to measure luminous transmittance is not of the integrating type, discrete transmittance measurements are taken at least every 10 nm. The luminous transmittance, τ, can then be calculated by approximating the integrals in equation (2) by finite sums:

$$\tau = \frac{\Phi_\tau}{\Phi} = \frac{\sum_{\lambda = 380\ \text{nm}}^{780\ \text{nm}} (\Phi_{e\lambda})_{\text{rel}}\tau(\lambda)V(\lambda)}{\sum_{\lambda = 380\ \text{nm}}^{780\ \text{nm}} (\Phi_{e\lambda})_{\text{rel}}V(\lambda)} \quad \ldots (3)$$

5 Apparatus

The instruments used to measure luminous transmittance shall have, throughout the range of measurement, a bandwidth $\Delta\lambda$ of 10 nm or less, centred on the wavelength λ under measurement.

6 Set up

6.1 Conditions

The measurement of transmittance of contact lenses shall be performed in saline solution. This is done so that the measured value represents the performance of the lens *in vivo* by simulating light losses due to reflection at the lens/tear layer interface by a lens/saline solution interface.

6.2 Arrangement

An example of an arrangement for carrying out the measurement is shown in figure 1.

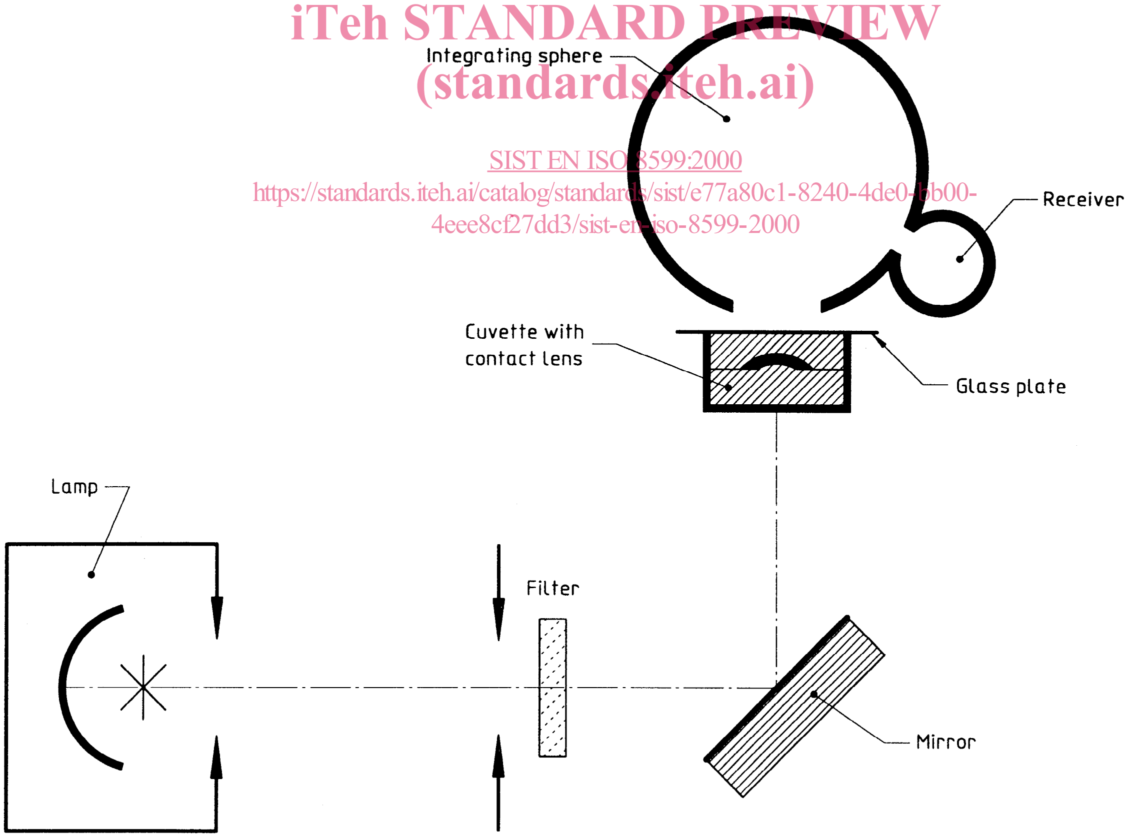

Figure 1 — Example of an arrangement for measuring the transmittance of contact lenses in standard saline solution

6.3 Positioning cuvette

Contact lenses and standard saline solution have similar densities. Thus a special cuvette is helpful (see figure 2) for positioning the contact lenses perpendicular to the incident parallel beam during the measurement. The contact lens is positioned on a circular diaphragm of 6 mm diameter using a centring ring. To obtain a constant depth of standard saline solution, the cuvette is closed with a glass plate.

7 Procedure

Carry out the measurements with the contact lens fully hydrated in standard saline solution in the measuring cuvette, and make the transmittance measurements with a parallel beam of diameter 6 mm, perpendicular to the contact lens.

Measure the intended values both with and without the contact lens. Calculate $\tau(\lambda)$ or τ from equation (1), (2) or (3).

NOTE 1 The luminous transmittance of many lenses has been measured in air. To correct these values to "measured in standard saline solution" values, the difference in surface reflections between the standard saline solution and the air method has to be taken into account. This is done by using the Fresnel transmittance formula for a dielectric interface under normal incidence:

$$T = \frac{4n_1n_2}{(n_1 + n_2)^2}$$

where n_1 and n_2 are the refractive indices of the two materials.

The converted luminous transmittance is then calculated as follows:

$$\tau_{\text{saline}} = M\tau_{\text{air}}$$

where

$$M = \left(\frac{(n_{\text{air}} + n_{\text{cl}})^2}{(n_{\text{saline}} + n_{\text{cl}})^2} \cdot \frac{n_{\text{saline}}}{n_{\text{air}}} \right)^2$$

$$n_{\text{air}} = 1$$

n_{saline} is the refractive index of the standard saline solution;

n_{cl} is the refractive index of the contact lens material.

Dimensions in millimetres

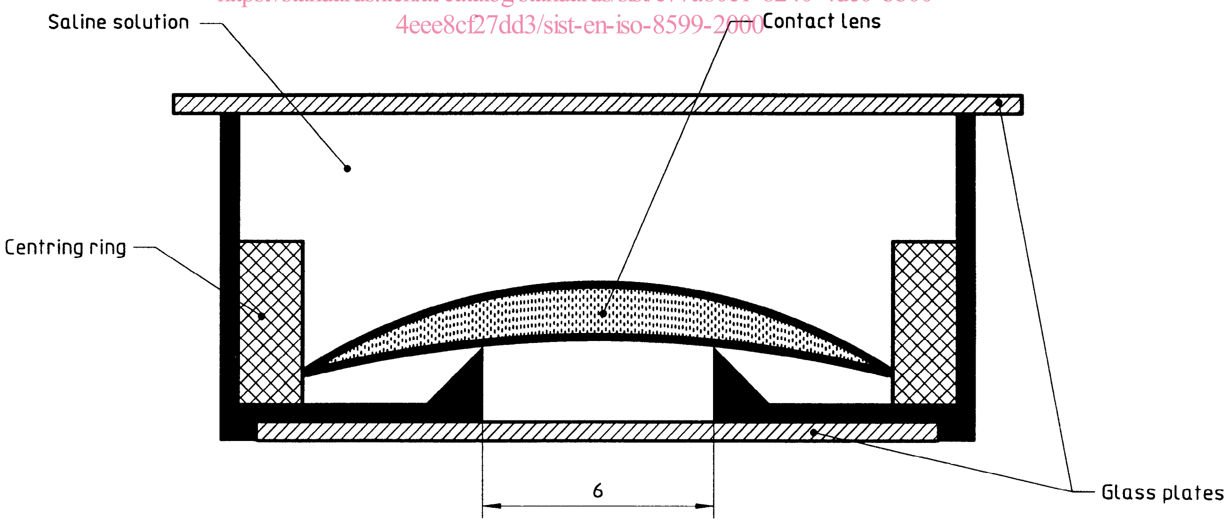

Figure 2 — Cuvette for measuring the transmittance of contact lenses in standard saline solution