



SLOVENSKI STANDARD

SIST EN 171:2002

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SIST EN 171:1996

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Personal eye-protection - Infrared filters - Transmittance requirements and recommended use

Persönlicher Augenschutz - Infrarotschutzfilter - Transmissionsanforderungen und empfohlene Verwendung

Protection individuelle de l'oeil - Filtres pour l'infrarouge - Exigences relatives au facteur de transmission et utilisation recommandée

Ta slovenski standard je istoveten z: EN 171:2002

ICS:

13.340.20 Varovalna oprema za glavo Head protective equipment

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en

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English version

Personal eye-protection - Infrared filters - Transmittance requirements and recommended use

Protection individuelle de l'oeil - Filtres pour l'infrarouge -
Exigences relatives au facteur de transmission et utilisation
recommandée

Persönlicher Augenschutz - Infrarotschutzfilter -
Transmissionsanforderungen und empfohlene Verwendung

This European Standard was approved by CEN on 20 January 2002.

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 Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 171:2002) has been prepared by Technical Committee CEN/TC 85 "Eye-protective equipment", 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 September 2002, and conflicting national standards shall be withdrawn at the latest by September 2002.

This document supersedes EN 171:1992.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

In this standard the annex A is normative and the annexes B and C are informative.

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

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1 Scope

This European Standard specifies the scale numbers and transmittance requirements for filters for protection against infrared radiation.

The other applicable requirements for these types of filters and the frames/mountings to which they are intended to be fitted are given in EN 166.

Guidance on the selection and use of these filters is given in annex B.

NOTE The protective filters specified in this standard are not suitable for the direct or indirect observation of an electric arc. For this purpose a welding filter appropriate to the source being observed should be used.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 165, *Personal eye-protection – Vocabulary*.

EN 166, *Personal eye-protection – Specifications*.

EN 167:2001, *Personal eye-protection – Optical test methods*.

ISO/CIE 10526:1991, *CIE standard illuminants for colorimetry*.

ISO/CIE 10527:1991, *CIE standard colorimetric observers*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 165 apply.

4 Designation and identification

The complete table of numbering of filters is given in EN 166.

The marking of oculars and frame is described in EN 166.

The scale number of infrared filters comprises the code number 4, and the shade number corresponding to the filter, from 1,2 to 10 (see Table 1).

5 Requirements

5.1 General

The requirements of EN 166 apply to infrared filters. Only those requirements that are different from or supplement the EN 166 specifications are given in this European Standard.

5.2 Transmittance requirements

The definitions of transmittances are given in EN 165.

The determination of luminous transmittance is described in EN 167:2001.

The transmittance requirements for filters used for protection against infrared radiation are given in Table 1.

Table 1 – Transmittance requirements

Scale number	Luminous transmittance τ_V		Maximum mean spectral transmittance in the infrared	
	Maximum %	Minimum %	τ_A 780 nm to 1 400 nm %	τ_N 780 nm to 2 000 nm %
4 – 1,2	100	74,4	5,5	52,9
4 – 1,4	74,4	58,1	4,8	47,2
4 – 1,7	58,1	43,2	4,1	42,2
4 – 2	43,2	29,1	3,6	37,9
4 – 2,5	29,1	17,8	2,9	32,3
4 – 3	17,8	8,5	1,9	22,9
4 – 4	8,5	3,2	1,2	15,9
4 – 5	3,2	1,2	0,71	10,6
4 – 6	1,2	0,44	0,43	7,1
4 – 7	0,44	0,16	0,23	4,4
4 – 8	0,16	0,061	0,14	2,9
4 – 9	0,061	0,023	0,075	1,8
4 – 10	0,023	0,0085	0,050	1,3

NOTE 1 The luminous transmittance, as shown in Table 1, is based on the spectral distribution for a full radiator at 1 900 °K and the CIE (1931) standard observer (2°) (see ISO/CIE 10526:1991 and ISO/CIE 10527:1991).

NOTE 2 Infrared filters should protect the user against infrared radiation whilst permitting proper vision of the visual task to be performed, including the recognition of safety signals. It is necessary in particular to take care that the chromaticity coordinates of the filters are compatible with good recognition of colour especially for good evaluation of melting furnace temperatures. Filters that do not conform to these criteria could lead to difficulties for users.

NOTE 3 Minimum and maximum values of luminous transmittance may be exceeded by taking into account the limits of relative uncertainty given in EN 167:2001.

5.3 Oculars with enhanced colour recognition (optional)

Between 500 nm and 650 nm, the spectral transmittance shall be not less than 0,2 τ_V .

The relative visual attenuation quotient Q , for signal lights red, yellow, green and blue shall be not less than 0,8.

Filters which fulfil this requirement, in addition to the transmittance requirements given in 5.2, may be marked "4C - Shade number".

5.4 Oculars with enhanced reflectance in the infrared (optional)

Oculars which are claimed to have enhanced reflectance in the infrared shall have a mean spectral reflectance greater than 60 % within the wavelength range 780 nm to 2 000 nm when measured in accordance with EN 167:2001, 6. Filters which fulfil this requirement, in addition to the transmittance requirements given in 5.2, may be marked "scale number - R".

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Annex A (normative)

Relative visual attenuation quotient for signal light recognition

A.1 Definition of relative visual attenuation quotient for signal light recognition

This quotient Q is defined as:

$$Q = \frac{\tau_{\text{sign}}}{\tau_v}$$

where

τ_v is the luminous transmittance of the filter for CIE standard illuminant D 65. See ISO/CIE 10526:1991

τ_{sign} is the luminous transmittance of the filter for the spectral power distribution of the traffic signal light.

These are given by the equations:

$$\tau_v = \frac{\int_{380 \text{ nm}}^{780 \text{ nm}} \tau_F(\lambda) \cdot V(\lambda) \cdot S_{D65\lambda}(\lambda) \cdot d\lambda}{\int_{380 \text{ nm}}^{780 \text{ nm}} V(\lambda) \cdot S_{D65\lambda}(\lambda) \cdot d\lambda}$$

$$\tau_{\text{sign}} = \frac{\int_{380 \text{ nm}}^{780 \text{ nm}} \tau_F(\lambda) \cdot \tau_s(\lambda) \cdot V(\lambda) \cdot S_{A\lambda}(\lambda) \cdot d\lambda}{\int_{380 \text{ nm}}^{780 \text{ nm}} \tau_s(\lambda) \cdot V(\lambda) \cdot S_{A\lambda}(\lambda) \cdot d\lambda}$$

where

$S_{A\lambda}(\lambda)$ is the spectral distribution of radiation of CIE standard illuminant A (or 3200 K light source for blue signal light). See ISO/CIE 10526:1991

$S_{D65\lambda}(\lambda)$ is the spectral distribution of radiation of CIE standard illuminant D65. See ISO/CIE 10526:1991

$V(\lambda)$ is the spectral visibility function for daylight vision. See ISO/CIE 10527:1991

$\tau_s(\lambda)$ is the spectral transmittance of the traffic signal lens;

$\tau_F(\lambda)$ is the spectral transmittance of the filter.