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Ögonskydd – Filter mot ultraviolet strålning – Fordringar på transmittans

Personal eye-protection – Ultraviolet filters – Transmittance requirements and recommended use

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English version

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

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

Persönlicher Augenschutz - Ultraviolettschutzfilter -
Transmissionsanforderungen und empfohlene Anwendung

This European Standard was approved by CEN on 12 September 2002.

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Foreword

This document (EN 170:2002) 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of an identical text or by endorsement, at the latest by April 2003, and conflicting national standards shall be withdrawn at the latest by April 2003.

This document supersedes EN 170:1992.

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 European Standard, Annex A is normative and 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.

EN 170:2002 (E)

1 Scope

This European Standard specifies the scale numbers and transmittance requirements for filters for protection against ultraviolet 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 are given in annex B.

NOTE The protective filters specified in this standard are not suitable for the direct viewing of bright light sources like Xenon high-pressure arc lamps or for the direct or indirect observation of an electric welding arc. For this purpose a welding filter as specified in EN 169 and with a scale number 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 165:1995, *Personal eye-protection – Vocabulary*.

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

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

ISO/CIE 10526:1999, *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 165:1995 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 ultraviolet filters comprises the code number 2 and the shade number corresponding to the filter, from 1,2 to 5 (see Table 1).

5 Requirements

5.1 General

The requirements of EN 166 apply to ultraviolet 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.

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

Table 1 – Transmittance requirements

Scale number	Maximum spectral transmittance in the ultraviolet $\tau(\lambda)$		Luminous transmittance τ_v		Transmittance in the infrared spectral range
	313 nm %	365 nm %	maximum %	minimum %	
2-1,2	0,0003	10	100	74,4	no specification
2-1,4	0,0003	9	74,4	58,1	
2-1,7	0,0003	7	58,1	43,2	
2-2	0,0003	5	43,2	29,1	
2-2,5	0,0003	3	29,1	17,8	
2-3	0,0003	2	17,8	8,5	
2-4	0,0003	0,8	8,5	3,2	
2-5	0,0003	0,3	3,2	1,2	

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

Additional requirements:

- a) for $210 \text{ nm} \leq \lambda \leq 313 \text{ nm}$ the spectral transmittance shall not exceed the value specified for 313 nm;
- b) for $313 \text{ nm} < \lambda \leq 365 \text{ nm}$ the spectral transmittance shall not exceed the value specified for 365 nm;
- c) for $365 \text{ nm} < \lambda \leq 405 \text{ nm}$ the spectral transmittance shall not exceed the luminous transmittance;

NOTE Luminous transmittance values are based on the spectral distribution of CIE illuminant A and on the CIE (1931) standard observer (2°) (see ISO/CIE 10526:1999 and ISO/CIE 10527:1991).

5.3 Ocular 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.

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:

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

where

τ_v is the luminous transmittance of the filter for CIE standard illuminant D 65. See ISO/CIE 10526:1999

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:

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

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

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 10526:1999

$S_{D65\lambda}(\lambda)$ is the spectral distribution of radiation of CIE standard illuminant D65. See ISO/CIE 10526:1999

$V(\lambda)$ is the spectral luminous efficiency for daylight vision. See ISO/CIE 10 527:1991

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

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

The spectral values of the products of the spectral distributions ($S_{A\lambda}(\lambda)$, $S_{D65\lambda}(\lambda)$), of the illuminants, the spectral luminous efficiency $V(\lambda)$ of the eye and the spectral transmittance $\tau(\lambda)$ of the traffic signal lenses are given in A.2.