

Personal eye-protection — Eye protectors for adjustment work on lasers and laser systems (laser adjustment eye-protectors)

The European Standard EN 208:1998, with the incorporation of amendment A1:2002, has the status of a British Standard

ICS 13.340.20

National foreword

This British Standard is the English language version of EN 208:1998, including amendment A1:2002. It supersedes BS EN 208:1994 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to CEN text carry the number of the amendment. For example, text altered by CEN amendment A1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted by Technical Committee PH/2, Eye protection, to Subcommittee PH/2/3, Eye protection against lasers, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 14, an inside back cover and a back cover.

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English version

Personal eye-protection — Eye-protectors for adjustment work on lasers and laser systems (laser adjustment eye-protectors)

(includes amendment A1:2002)

Protection individuelle de l'oeil —
Lunettes de protection pour les travaux de réglage sur les lasers et sur les systèmes laser (lunettes de réglage laser)
(inclut l'amendement A1:2002)

Persönlicher Augenschutz —
Augenschutzgeräte für Justierarbeiten an Lasern und Laseraufbauten (Laser-Justierbrillen)
(enthält Änderung A1:2002)

This European Standard was approved by CEN on 24 August 1998. Amendment A1 was approved by CEN on 30 May 2002.

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CEN

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

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

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 85, Eye protective equipment, the Secretariat of which is held by AFNOR.

This European Standard supersedes EN 208:1993.

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 March 1999, and conflicting national standards shall be withdrawn at the latest by March 1999.

This European Standard 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 standard.

Annex A, Annex B and Annex ZA 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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This amendment EN 208:1998/A1:2002 to the EN 208:1998 has been prepared by Technical Committee CEN/TC 85, Eye protective equipment, the Secretariat of which is held by AFNOR.

This amendment to the European Standard EN 208:1998 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2003, and conflicting national standards shall be withdrawn at the latest by February 2003.

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).

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 applies to laser adjustment filters and eye-protectors. These are filters and eye-protectors for use in adjustment work on lasers and laser systems as defined in EN 60825-1:1994 [i.e. LED (light emitting diode) radiation is included] where hazardous radiation occurs in the visible spectral range of 400 nm to 700 nm. Filters specified in this standard reduce this radiation to values defined for lasers of class 2 [≤ 1 mW for CW (continuous wave) lasers]. In this case aversion responses including the blink reflex contribute to eye-protection.

This standard defines requirements, test methods and marking. A guide is given in Annex B with regard to selection and use.

EN 207 applies to eye-protection against laser radiation where aversion responses, including the blink reflex are not stipulated, and laser radiation outside the visible spectral range.

NOTE Before selecting eye-protection according to this standard a risk assessment should be undertaken (see Annex B).

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.

EN 166:1995, *Personal eye-protection — Specifications*.

EN 167:1995, *Personal eye-protection — Optical test methods*.

EN 168:1995, *Personal eye-protection — Non-optical test methods*.

EN 207:1998, *Personal eye-protection — Filters and eye-protectors against laser radiation (laser eye-protectors)*.

EN 60825-1:1994, *Safety of laser products, equipment classification, requirements and user's guide*.

ISO/CIE 10526:1991, *CIE standard colorimetric illuminants*.

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

3 Requirements

3.1 Spectral transmittance of filters and frames

The spectral transmittance values of the filters and the frames for the laser wavelength shall be as given in Table 1.

3.2 Luminous transmittance of filters

When assessed in accordance with 4.2, the luminous transmittance of the filter relative to the D65 standard illuminant (see ISO/CIE 10526:1991) shall be at least 20 %, unless it is recommended in the information supplied by the manufacturer to increase accordingly the intensity of illumination at the relevant work place.

3.3 Stability of filters and frames to laser radiation

When tested according to 4.3, the filters and frames shall meet the requirements of 3.1 and shall not lose their protective effect under the influence of laser radiation of the power (E) or energy density (H) given in Table 2 for a period of at least 10 s and for 100 pulses. They shall not show any induced transmission (reversible bleaching). No splinters shall come away from the side of the filter facing the eye under the influence of the laser radiation. Any melting or other damage of the surface is not considered negative if the protective effect is still ensured.

Table 1 — Scale numbers, spectral transmittance and maximum laser power

Scale number	Spectral transmittance		CW lasers and pulse lasers with a pulse duration of $\geq 2 \times 10^{-4}$ s	Pulse lasers with a pulse duration of $>10^{-9}$ s to 2×10^{-4} s
	Filter	Frame	Maximum laser power W	Maximum pulse energy J
R1	$10^{-2} < \tau(\lambda) \leq 10^{-1}$	$\tau(\lambda) \leq 10^{-1}$	0,01	2×10^{-6}
R2	$10^{-3} < \tau(\lambda) \leq 10^{-2}$	$\tau(\lambda) \leq 10^{-2}$	0,1	2×10^{-5}
R3	$10^{-4} < \tau(\lambda) \leq 10^{-3}$	$\tau(\lambda) \leq 10^{-3}$	1	2×10^{-4}
R4	$10^{-5} < \tau(\lambda) \leq 10^{-4}$	$\tau(\lambda) \leq 10^{-4}$	10	2×10^{-3}
R5	$10^{-6} < \tau(\lambda) \leq 10^{-5}$	$\tau(\lambda) \leq 10^{-5}$	100	2×10^{-2}

Table 2 — Power density and energy density for testing

Scale number	Power density E W/m ²	Energy density H J/m ²
R1	1×10^4	2
R2	1×10^5	20
R3	1×10^6	200
R4	1×10^7	2 000
R5	1×10^8	20 000

3.4 Refractive values of filters and eye-protectors

When assessed in accordance with 4.4, the maximum refractive values of filters and eye-protectors with no corrective effect shall be as given in Table 3. They apply for the range specified in EN 166:1995.

Table 3 — Maximum refractive values of filters and eye-protectors with no corrective effect

Spherical power	Astigmatic power	Prismatic power difference		
		Horizontal		Vertical
		Base out cm/m	Base in cm/m	
$\pm 0,09$	$\pm 0,09$	0,75	0,25	0,25

NOTE The requirements of the national standards apply to laser radiation protection filters with a corrective effect up until such times as corresponding European Standards have been prepared.

3.5 Quality of material and surface of filters

3.5.1 Material and surface defects

The material and surface defects of filters shall be assessed in accordance with 4.5.1.

Except for a marginal area 5 mm wide, filters shall be free from any material or surface defects likely to impair the intended use, such as bubbles, scratches, inclusions, dull spots, mould marks, scoring or other defects originating from the manufacturing process. No holes are allowed anywhere in the filters.

3.5.2 Scattered light

The reduced luminous coefficient l^* of a filter, determined in accordance with 4.5.2, shall not be greater than:

$$l^* = 0,50 \text{ (cd/m}^2\text{)/lx}$$