BRITISH STANDARD

BS EN
175 : 1997

Personal protection — Equipment for eye and face protection during welding and allied processes

The European Standard EN 175 : 1997 has the status of a British Standard

ICS 13.340.20

National foreword

This British Standard is the English language version of EN 175 : 1997. It supersedes BS 1542 : 1982, which is withdrawn.

The UK participation in its preparation was entrusted to subcommittee PH/2/2, Industrial eye protectors, 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 committee can be obtained on request to its secretary.

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Summary of pages

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English version

Personal protection — Equipment for eye and face protection during welding and allied processes

Protection individuelle — Equipements de protection des yeux et du visage pour le soudage et les techniques connexes

Persönlicher Schutz — Geräte für Augen- und Gesichtsschutz beim Schweißen und bei verwandten Verfahren

This European Standard was approved by CEN on 1996-12-29. 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

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

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Ref. No. EN 175 : 1997 E

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 shall be given the status of a national standard, either by publication of an identical text or by endorsement at the latest by January 1998, and conflicting national standards shall be withdrawn at the latest by January 1998.

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 is 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.

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1 Scope

This European Standard specifies safety requirements and test methods for personal protective equipment used to protect the operator's eyes and face against harmful optical radiation and other specific risks or hazards in usual welding, cutting or similar operations. This standard specifies protection including ergonomic aspects against risks or hazards of radiative, flammable, mechanical and electrical nature. The equipment is designed to incorporate protective filters, with or without cover/backing oculars as recommended by the welding protector manufacturer, in accordance with EN 166 : 1995 and complying with EN 169 : 1992 or EN 379 : 1994.

Hoods, inspector face screens, laser protective equipment and welding protection for special applications, are not covered in this standard.

This standard defines the terms used and specifies requirements for materials, design and manufacture.

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 165 : 1995 *Personal eye-protection — Vocabulary*

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

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

EN 169 : 1992 *Personal eye-protection — Filters for welding and related techniques — Transmittance requirements and recommended utilization*

EN 379 : 1994 *Specification for welding filters with switchable luminous transmittance and welding filters with dual luminous transmittance*

3 Definitions

For the purposes of this standard, the definitions of EN 165 : 1995 apply together with the following:

3.1 welding protector

A device which provides protection to the wearer against harmful optical radiation and other specific risks generated by welding or allied processes.

NOTE. It may be a welding shield, a welding goggle or welding spectacles.

3.2 welder's face shield

A welder's shield worn on the head and in front of the face, usually secured in position by a harness to give protection to the eyes and face when fitted with the appropriate filter(s).

3.3 welder's hand shield

A welder's shield held in the hand to give protection to the eyes and face when fitted with the appropriate filter(s).

3.4 safety helmet mounted welder's face shield

A welder's shield mounted on a compatible safety helmet, that gives protection to the eyes and face when fitted with the appropriate filter(s).

3.5 welder's goggle

A device held in position usually by a headband, enclosing the orbital cavity into which radiation arising from welding operation can penetrate only through filter(s) and, where provided, filter cover(s).

3.6 welder's spectacles

A frame, with lateral protection, holding suitable filters in front of the eyes, to give them protection.

NOTE. It may usually be held in position with sidearms or a headband fitting.

3.7 harness

An assembly that provides a means of maintaining a welder's face shield in position on the head.

3.8 headband

That part of the harness to which the welder's face shield is fixed and which surrounds the head, or that part of the goggle or spectacle which secures the goggle or spectacle, onto the head.

3.9 comfort band or sweat band

An accessory to cover at least the inner front surface of the headband to improve wearer comfort.

3.10 housing

The part of equipment that supports the filter(s), cover(s) and/or backing oculars.

3.11 backing ocular

A generally untinted ocular used mainly to protect the wearer from flying particles.

4 Design and manufacture

4.1 General construction

All welding protectors and component parts shall be free from projections, sharp edges or other defects which are likely to cause discomfort or injury to the user.

4.2 Field of vision

The field of vision shall not be obstructed except by the boundaries of the filter holders.

4.3 Materials

No parts of the welding protector which are in contact with the wearer shall be made of materials which are known to cause skin irritation.

4.4 Headbands

Headbands, when used as the principal means of retention, shall be at least 10 mm wide.

4.5 Heat insulation

All metal fittings that are likely to be exposed to thermal radiation shall be, where applicable, insulated to protect the wearer from exposure to excessive heat.

4.6 Replacement

Filters and cover/backing oculars shall be readily replaceable by the wearer without the use of special tools.

5 Requirements

5.1 General requirements

Welding protector housings shall provide at least the same protection against radiation as that given by the darkest filters declared usable by the manufacturer or supplier.

Ventilation, where provided, shall be such that the intended protection shall not be affected.

5.2 Dimensions

5.2.1 *Welder's spectacles and goggles*

The dimensions of the visible aperture of the welding spectacles and goggles shall meet the requirements of **7.1.1** in EN 166 : 1995.

5.2.2 *Welder's hand shields*

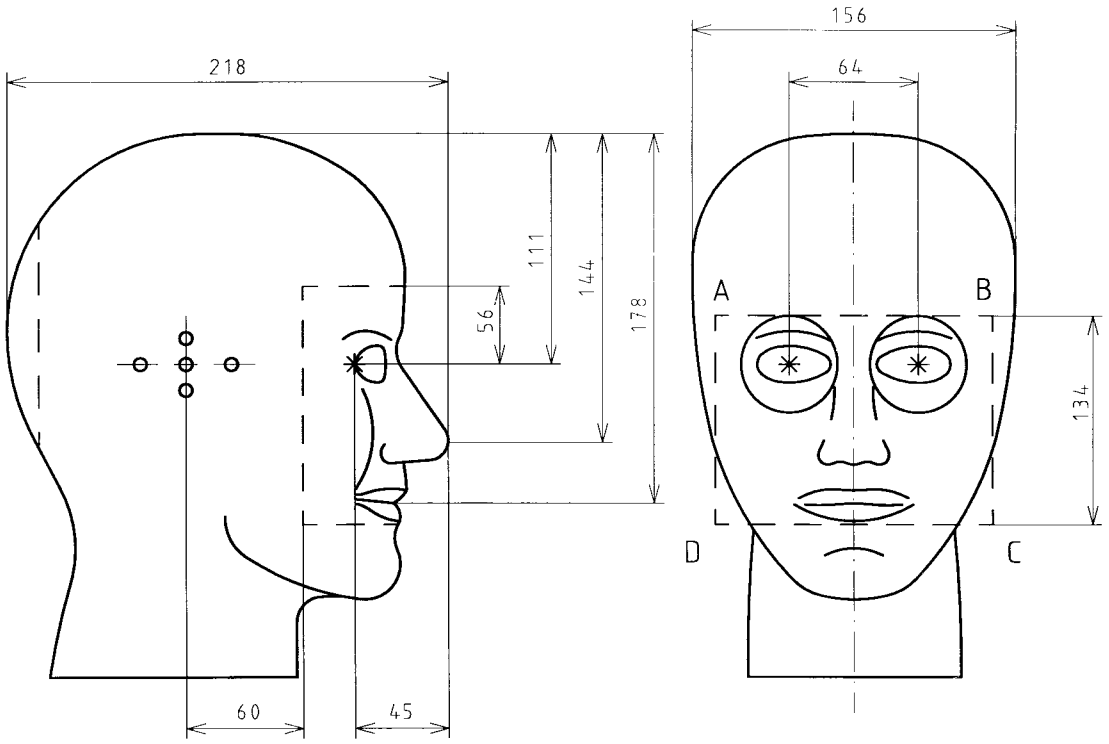
Minimum height: 350 mm

Minimum width: 210 mm

When measured from the centre of the ocular the minimum depth shall not be less than 75 mm.

5.3 Area of coverage for welder's face shields and safety helmet mounted welder's face shields

Welder's face shields and safety helmet mounted welder's shields shall cover the eye region rectangle (ABCD) of the headform in accordance with EN 168 : 1995 as defined in figure 1 and assessed in accordance with **8.1** of this standard.



Dimensions in millimetres (nominal)

Figure 1. Reference headform

5.4 Increased robustness of welder's face shields, goggles and spectacles

All welding protectors shall meet the requirements in **7.1.4.2.2** of EN 166 : 1995 when fitted with a filter meeting the increased robustness requirement. If the use of any cover and/or backing ocular(s) is recommended by the welding protector manufacturer in accordance with item f) of clause **10** the test shall be done according to this recommendation.

NOTE. This does not imply that welding protectors during use always have to be equipped with cover and/or backing oculars or filters meeting the increased robustness requirement.

5.5 Resistance of welder's shields to damage when dropped

When tested in accordance with **8.2** the welder's shield shall show no apparent deformation, nor crack, break into two or more pieces or otherwise suffer permanent damage likely to affect performance. Also, the filter and cover/backing ocular(s) shall not suffer permanent damage likely to affect performance.

5.6 Light reflectance of welder's shields

All inside surfaces of the welder's shields shall be matt finish.

5.7 Light attenuation of welder's shields

When tested according to **8.4** no non-attenuated light shall be visible in any of the specified positions of the welder's shield.

5.8 Electrical insulation of welder's shields

When measured according to **8.3** the leakage current shall not be greater than 1,2 mA.

5.9 Resistance to ignition

All welding protectors shall meet the requirements of **7.1.7** in EN 166 : 1995.

5.10 Resistance of welder's shields to hot penetration

When tested in accordance with clause **7** of EN 168 : 1995, the hot rod shall not penetrate the welding protector within 5 s.

5.11 Resistance to corrosion

All welding protectors shall meet the requirements of **7.1.6** in EN 166 : 1995.

5.12 Suitability of cleaning and disinfection

All parts of welding protectors shall be capable of withstanding, without visible change, cleaning and disinfection in accordance with the manufacturer's recommended method.

5.13 Mass

5.13.1 *Mass of welder's face shield*

If the mass of a welder's face shield exceeds 450 g, when measured without oculars, then the shield shall be clearly marked with the actual mass in grams.

5.13.2 *Mass of welder's hand shield*

If the mass of a welder's hand shield exceeds 500 g when measured with the handle but without oculars, then the shield shall be clearly marked with the actual mass in grams.

6 Harness of welder's face shields

6.1 General

The harness shall be capable of holding the welder's face shield in the correct position when properly adjusted. The face shield shall remain secure and comfortable whatever the orientation of the wearer's head.

6.2 Adjustment

The harness shall be adjustable to fit the wearer's head in both circumference and height, and shall sit securely and comfortably without undue pressure or slip.

6.3 Replacement

Harness and headbands, as appropriate, shall be capable of replacement without the use of special tools.

7 Requirements for protective equipment with special characteristics

7.1 Protection against high-speed particles

Welding protectors intended to provide protection against high-speed particles shall withstand the impact of a 6 mm nominal diameter steel ball of 0,86 g minimum mass, striking the oculars and the lateral protection at one of the speeds given in table 1. When tested the welding protector shall be fitted with the filter and any cover and/or backing ocular(s) recommended by the welding protector manufacturer in accordance with clause **10**f.

Welding protectors for protection against high speed particles shall also meet the requirements for increased robustness given in **5.4**.

The test shall be in accordance with the method specified in clause **9** of EN 168 : 1995.

On so testing the following shall not occur.

a) Ocular fracture: An ocular shall be considered to have fractured if it cracks through its entire thickness into two or more pieces, or if more than 5 mg of the ocular material becomes detached from the surface away from the one struck by the ball, or if the ball passes through the ocular.

b) Ocular deformation: An ocular shall be considered to have been deformed if a mark appears on the white paper on the opposite side to that struck by the ball.

c) Ocular housing or frame failure: An ocular housing or frame shall be considered to have failed if it separates into two or more pieces, or if it is no longer capable of holding an ocular in position, or if an unbroken ocular detaches from the frame, or if the ball passes through the housing or frame.

Table 1. Requirements relating to protection against high speed particles			
Type of eye-protector	**Impact speed of ball**		
	Low energy impact $45\ ^{+1,5}_{0}$ m/s	**Medium energy impact** $120\ ^{+3}_{0}$ m/s	**High energy impact** $190\ ^{+5}_{0}$ m/s
Spectacles	+	Not applicable	Not applicable
Goggles	+	+	Not applicable
Welder's face shields	+	+	Not applicable

7.2 Protection against molten metals and hot solids

Welding protectors intended to provide protection against molten metals and hot solids, excluding spectacles, shall meet the requirements of **7.2.3** of EN 166 : 1995.

7.3 Stability to water immersion of welding shields

After immersion in water, carried out in accordance with **8.5** of this standard, the dimensions of welder's hand shields as specified in **5.2.2** shall remain within 5 %. Welder's face shields shall still meet the area of coverage test as specified in **5.3**.

8 Test methods

8.1 Test for area of coverage of welder's face shields and safety helmet mounted welder's face shields

8.1.1 *Principle*

A welder's face shield is mounted on the headform, in accordance with the manufacturers instructions and the extent of coverage is assessed by observing the marks on the headform after the test has been carried out.

8.1.2 *Apparatus*

As described in **10.2.2** of EN 168 : 1995.

8.1.3 *Procedure*

The apparatus is arranged as shown in figure 4 of EN 168 : 1995 such that the axis of rotation A and the axis C intersect on the surface of the headform at the mid-point of a line joining the eye centres.

The welder's shield is fitted to the headform in accordance with the manufacturers instructions.

The laser beam is projected at, and a mark made at, each point on the headform, as close as possible to the edge of the welder's shield being tested, with the headform set in the following positions:

a) facing forwards and rotated 30° forwards about horizontal axis A;

b) facing forwards and rotated 30° backwards about horizontal axis A;

c) rotated 90° to the left about vertical axis B and rotated 30° forwards about horizontal axis A

d) rotated 90° to the left about vertical axis B and rotated 30° backwards about horizontal axis A;

e) rotated 90° to the right about vertical axis B and rotated 30° forwards about horizontal axis A;

f) rotated 90° to the right about vertical axis B and rotated 30° backwards about horizontal axis A.

NOTE. Adjustments to the horizontal position of the headform and the height of the laser can be necessary to locate the laser on the relevant points on the headform.

8.1.4 *Report*

If any of the marks made on the headform are within the area of the eye region rectangle as defined in **5.3**, figure 1, the area of coverage is considered to be insufficient.

8.2 Drop test of welder's shields

8.2.1 *Principle*

The welder's shields are dropped from a specified height on to a steel plate.

8.2.2 *Apparatus*

8.2.2.1 *Smooth steel plate*, not less than 500 mm × 500 mm × 10 mm thick.

8.2.2.2 *Means of suspending welding shields.*

8.2.3 *Conditioning*

One welder's shield is conditioned for $(120\ ^{+30}_{0})$ min at (−5 ± 2) °C.

One welder's shield is conditioned for $(120\ ^{+30}_{0})$ min at (80 ± 2) °C.

8.2.4 *Procedure*

Remove the welder's shield from the conditioning cabinet. Suspend the welder's shield by the top of the shield.

Adjust the height of the lowest point of the shield to (1,50 ± 0,01) m above the steel plate. Drop the welder's shield on to the plate within 10 s after removal from the conditioned cabinet. Immediately after each drop the shield is reconditioned for at least 30 min. Repeat this procedure to complete 3 drops.

8.2.5 *Report*

Any deformation or permanent damage to the welding shield, filter, or cover/backing oculars shall be recorded.

8.3 Test for electrical insulation of welder's shields

8.3.1 *Principle*

The outer surface of the welder's shield is covered with a damp cloth and placed on a metal plate. An electrical potential is applied between the metal plate and the inside of the shield. The leakage current is measured.

8.3.2 *Procedure*

Place the welder's shield, when fitted with a recommended ocular, on the metal plate ensuring the greatest possible contact between the cloth and the plate.

Fit one electrode to the metal plate and the other is used as a contact testing finger. A milli-amperemeter is connected, in series, to either of the electrodes.

Apply an alternating voltage, at (50 ± 5) Hz, of (440 ± 10) Volts to the electrodes, make a minimum of 10 contacts with the testing finger to different points on the inside of the welder's shield, touching in any case the ocular housing, paying particular attention to areas where metal components have been used in its construction, and measure the leakage current.

8.3.3 *Report*

Any leakage which exceeds 1,2 mA.

8.4 Test for light attenuation of welder's shields

8.4.1 *Principle*

Place the welder's shield, when fitted with a recommended ocular, directly in front of a light source. Then swivel the shield and make a check to ensure no non-attenuated light rays are visible. This test shall be carried out on a welder's shield that has been drop tested in accordance with **8.2**.

8.4.2 *Procedure*

Place the equipment to be tested directly in front of a light source with a minimum output of 1 200 lumens. Position the welding shield in such a way that the centre of the light source is (500 ± 10) mm away, on a perpendicular axis, to the centre of the ocular. Swivel the welding shield $(20\ ^{+5}_{0})^{\circ}$ up and down on the vertical axis and $(2450\ ^{+5}_{0})^{\circ}$ either side on the horizontal axis.

8.4.3 *Report*

At each of the four points check that no non-attenuated light rays are visible.

8.5 Test for water immersion (welder's shields only)

8.5.1 *Principle*

The welder's shield is immersed in water for a period of time to determine its dimensional stability.

8.5.2 *Procedure*

The welder's shield to be tested shall already meet either of the criteria specified in clauses **5.2** or **5.3**.

Immerse the welding shield in water at a temperature of (23 ± 2) °C for a period of (120 ± 5) min. Remove the welding shield and leave for (5 ± 1) min.

The dimensions of welder's hand shields shall not vary by more than 5 % and shall still meet the requirements of **5.2**. Welder's face shields shall still meet the requirements for the area of coverage as specified in **5.3**.

8.5.3 *Report*

Note the area of coverage, dimensions and dimension variations, as appropriate.

9 Marking

9.1 General

In order to be able to identify and use a welder's protector as intended, it shall be permanently marked to indicate its field of use.

The marking shall be visible when the welding protector is assembled.

9.2 Frame marking

The marking of frames or housings shall contain the relevant technical information as follows:

a) identification of the manufacturer;

b) the number of this standard

c) field(s) of use (where applicable);

d) mass in grams (where applicable).

NOTE. The identification mark may consist of one or more elements.

9.3 Designation

The frame of welding protectors shall be designated to indicate their intended field of use. The designation symbol shall comprise a single digit number or letter as defined in table 2. If the protector covers more than one field of use the appropriate number/letter shall be applied.

Table 2. Symbols for field of use

Symbol	Type of protection	Description of the field of use
S	Increased robustness	Mechanical strength
9	Molten metals and hot solids	Splashes of molten metals and penetration of hot solids
–F	Low energy impact	Mechanical strength
–B	Medium energy impact	Mechanical strength
W	Water immersion	Dimensional stability

The example below shows the principles of the designation:

EXAMPLE : Welder's face shield EN 175 S 9

where:

EN 175	is the standard number;
S	is increased robustness;
9	means protection against molten metals and hot solids.

10 Information for users

The manufacturer shall provide with each welder's protector at least the following information:

a) name and address of the manufacturer;

b) the number of the standard;

c) model identification;

d) instructions for storage, use and maintenance;

e) specific instructions for cleaning and disinfection;

f) details of suitable filters and cover and/or backing oculars;

g) details of field of use, protection capabilities and performance characteristics;

h) details of suitable accessories, spare parts and instructions for fitting;

i) the obsolescence deadline or duration of use until obsolescence, if applicable, for the complete welding protector and/or component parts;

j) the type of packaging suitable for transport, if applicable;

k) the meaning of the marking;

l) a warning that materials which may come into contact with the wearer's skin could cause allergic reactions to susceptible individuals;

m) a warning that scratched or damaged oculars should be replaced;

n) details of limitation of use;

o) a warning that toughened mineral filter oculars shall only be used in conjunction with a suitable backing ocular.

Annex A (informative)

Guidance on design of welder's shields

This annex contains guidance on the design of welder's shields.

– The design of welder's shield should be such that CO_2 build up in the respiratory area is minimized.

– The lower part of any welder's face shield should be designed so that welding fumes are guided away from the respiratory area.

– Welder's shields of convex nature allow metal droplets to roll off readily in overhead welding situations.

– Welder's face shield fitted with oculars recommended by the manufacturer should be designed to be well balanced.

– The shield should, e.g. at the head gear, include a stopping mechanism in order that the shield shall not injure the throat when being positioned downwards.

– The shield should have low thermal conductivity.

– Welder's face shields may include devices to protect the wearer's ears, throat and respiratory tract.

Annex ZA (informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

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 Directives 89/686/EEC.

WARNING. Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The following clauses of this standard are likely to support requirements of Directive 89/686/EEC, Annex II:

Directive 89/686/EEC, Annex II		**Clauses of this standard**
1.1	Design principles	**4, 5.13, 6.1, 6.2**
1.2	Innocuousness of PPE	**4, 5, 6**
1.3	Comfort and efficiency	**6.1, 6.2, 7.3**
1.4	Information supplied by the manufacturer	**10**
2.3	PPE for the face, eyes and respiratory tracts	**4.2, 5.2**
2.4	PPE subject to ageing	**5.11, 10**
2.9	PPE incorporating components which can be adjusted or removed by the user	**4.6, 6.3**
3.1	Protection against mechanical impact	**5.4, 5.5, 7.1**
3.3	Protection against physical injury (abrasion, perforation, cuts and bites)	**5.10**
3.6	Protection against heat and/or fire	**4.5, 5.9, 7.2, 5.10**
3.8	Protection against electric shock	**5.8**
3.9	Radiation protection	**5.1, 5.3, 5.7**

Compliance with the clauses of this standard provides one means of conforming with the specific essential requirements of the Directives concerned and associated EFTA regulations.

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