

Specification for
**Eye-protectors for
racket sports —**

Part 1: Squash

ICS 13.340.20; 97.220.30

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee PH/2, Eye protection, to Subcommittee PH/2/9, Eye-protectors for leisure activities, upon which the following bodies were represented:

Association of Consulting Scientists
 British Safety Industry Federation
 BSIF Test and Certification Association
 College of Optometrists
 Consumer Policy Committee of BSI
 Electricity Association
 Federation of Manufacturing Opticians
 Health and Safety Executive
 Institution of Mechanical Engineers
 International Squash Rackets Federation
 National Physical Laboratory
 Royal College of Ophthalmologists
 Safety Equipment Association
 Sports Vision Association
 Squash Rackets Association
 Tennis and Rackets Association

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Foreword

This part of BS 7930 has been prepared by Subcommittee PH/2/9, Eye-protectors for leisure activities. This is anticipated to be the first of several parts of BS 7930, each specifying requirements for eye-protectors for one or more racket sports. Research is ongoing into requirements for other sports. Part 1 of BS 7930 is limited to eye protection for the sport of squash.

The eye-protectors are intended to confer protection when playing squash and are designed to reduce significantly, or to minimize, injury to the eye and the adnexa due to impact.

Comfort is a prime consideration if players at every level of play are to be persuaded to wear eye-protectors. It is important that the eye-protector does not mist or cause problems due to perspiration. It is also important that the eye-protector is held firmly to the face, and does not move during play nor intrude unduly into the field of view. The eye-protector is intended to cause minimum interference with the player's game and is also intended to cause no injury to other players.

This standard excludes eye-protectors designed to be worn over other spectacles. It is not possible to judge the safety of such eye-protectors, because during an impact, injury to the eye may be caused by the underlying spectacles, the quality and style of which may vary, and which may not meet any safety standard.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover and a back cover.

1 Scope

This part of BS 7930 specifies design, manufacture and performance requirements for eye-protectors, for use by players of the game of squash. Requirements for the marking of eye-protectors and for information to be supplied by the manufacturer are also specified.

This standard applies only to eye-protectors with polycarbonate oculars. It applies to eye-protectors which incorporate prescription lenses, but not to eye-protectors designed for use over spectacles.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 2738-1, *Spectacle lenses — Part 1: Specification for tolerances on optical properties of mounted spectacle lenses.*

BS EN 166:1996, *Personal eye protection — Specifications.*

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

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

BS EN 1836:1997, *Personal eye protection — Sunglasses and sunglare filters for general use.*

3 Terms and definitions

For the purposes of this part of BS 7930, the following definitions apply.

3.1

eye-protector

any form of protective equipment covering the orbital cavities and margins whilst permitting a defined level of vision

3.2

ocular aperture

that part of the eye-protector through which the wearer sees

3.3

lens

transparent component filling the ocular aperture for a single eye

3.4

screen

transparent component filling the ocular aperture of both eyes together

3.5

ocular

lens or screen

3.6

orbital cavities

aperture in the skull in which the eyes and their appendages sit

3.7

frame

part of the eye-protector to which the oculars are mounted

3.8

field of view

binocular field visible to the wearer of an eye-protector (allowing for eye movement)

4 Design and manufacture

4.1 General

Eye-protectors shall have no projection or sharp edge which could cause discomfort in wear, or which could cause injury to the wearer or other person should the eye-protector be struck by a squash ball or racket, or if the wearer collides with another player.

4.2 Materials

No parts of the eye-protector which are in contact with the wearer shall be made from materials known to be physiologically incompatible or known to create a significant number of allergic reactions when used as intended by the manufacturer.

4.3 Fit and retention

The eye-protector shall fit so as to be firmly retained during play.

NOTE 1 Manufacturers may wish to consider providing a range of sizes of eye-protector, in addition to provision for adjustment.

NOTE 2 Fogging of lenses is a safety problem which may be reduced, for example, by the use of hydrophobic coatings.

4.4 Field of view

When tested subjectively with a perimeter, eye-protectors shall allow a minimum overall field of view having the following values:

- a) 80° temporally;
- b) 60° inferiorly;
- c) 40° nasally; and
- d) 45° superiorly

NOTE 1 The peripheral field is not necessarily bounded by the protector frame.

NOTE 2 Examples of suitable perimeters include a Goldmann or a Lister perimeter.

4.5 Resistance to corrosion caused by perspiration

When tested by the method given in BS EN 168:1995, clause 8, the eye-protector shall exhibit no corrosion or change of colour visible to the unaided eye.

After testing in accordance with BS EN 168:1995, clause 8, eye-protectors which include hinged components (for example sides) shall be operated over their full range of normal movement. Following this operation, no damage or degradation shall be visible to the unaided eye.

5 Optical properties of oculars

5.1 Transmittance

5.1.1 Indoor use, and use under artificial light or in low light conditions

Irrespective of the number of its optical elements, the ocular shall transmit not less than 80 % of a beam of light emitted by a gas-filled tungsten filament lamp operating at a colour temperature of 2856 K, measured at the visual centre of the ocular corresponding to a nominal pupillary distance of 64 mm.

5.1.2 Outdoor use in sunlight

The transmittance of oculars shall conform to that specified for filter category 0, 1 or 2 of BS EN 1836:1997, Table 1.

5.2 Inherent defects

The ocular shall be free, to within 3 mm of the edge, from inherent defects, such as bubbles, grains, clouding, holes, cracks, waves and dull spots, that are visible to the unaided eye, and visible to the wearer when the eye-protector is worn.

5.3 Tolerances

When tested in accordance with BS EN 167:1995, clause 3, oculars of nominal plano power shall have the following tolerances:

- a) spherical power:
 - $\pm 0.12 \text{ D}^1$, at the visual centre of the ocular, corresponding to a nominal pupillary distance of 64 mm;
- b) astigmatic power:
 - $\pm 0.12 \text{ D}$, at the visual centre of the ocular, corresponding to a nominal pupillary distance of 64 mm;
- c) prismatic effect:
 - difference in prismatic power between the visual centres of the oculars, corresponding to a nominal pupillary distance of 64 mm:

base out: $1.00 \Delta^2$

base in: 0.25Δ

vertical: 0.25Δ

5.4 Prescription oculars

Eye-protectors with prescription oculars shall conform to BS 2738-1.

6 Resistance to impact

When tested in accordance with annex A, none of the specimens shall fail in any of the following ways.

- 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 any material should become detached from the surface away from the one in contact with the squash ball.
- b) Eye contact. Eye contact shall be considered to have occurred if a mark appears on the white paper inserted between the eye-protector and the head-form.
- c) Backward displacement of the ocular from the frame.
- d) 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 the squash ball passes through the housing or frame.
- e) Lateral protection failure. The lateral protection shall be considered to have failed if one or more of the following occurs.
 - It fractures through its entire thickness into two or more separate pieces.
 - One or more particles becomes detached from the surface remote from the impact point.
 - It allows the squash ball to penetrate completely.
 - It becomes partially or totally detached from the eye-protector.
 - Its component parts become separated.

¹⁾ D = diopetre.

²⁾ Δ = prism doptre.

7 Marking

7.1 Oculars

7.1.1 Oculars, unless moulded integrally with the frame, shall be legibly and permanently marked with the following information:

- a) the identification mark of the manufacturer;
- b) the number and date of this standard, i.e. BS 7930-1:1998³⁾.

7.1.2 The markings shall be located within 5 mm of the edge of the ocular, excluding the chamfer.

7.2 Frames

Frames shall be legibly and permanently marked with the following information:

- a) the identification mark of the manufacturer;
- b) the number and date of this standard, i.e. BS 7930-1:1998³⁾;
- c) the model size, if applicable.

8 Information to be supplied by the manufacturer

8.1 Name and address

In addition to the information specified in clause 7, the name and address of the manufacturer and/or his agent shall be provided on the packaging and accompanying documentation.

8.2 Instructions for use

8.2.1 Instructions for use shall be provided by the manufacturer, giving the following information:

- a) that the eye-protector is intended to help prevent eye injury during the game of squash and is not designed to protect against head and facial injuries;
- b) that no eye-protector can protect against all possible impacts;

c) an explanation of the markings specified in clause 7;

d) advice on correct fitting and adjustment to ensure firm retention during play;

e) advice on care, cleaning and storage;

f) a warning that the eye-protector is not to be worn over spectacles.

NOTE Items d) and f) should be displayed prominently on the packaging.

8.2.2 The following warnings shall be displayed prominently on the packaging.

a) Any severe blow to the eye-protector, even one which does not cause visible damage, may weaken the eye-protector, which should be replaced.

b) If an ocular becomes detached from an eye-protector, the eye-protector should be replaced.

8.2.3 A statement indicating the sport for which the eye-protector is intended shall be displayed prominently on the packaging.

³⁾ Marking BS 7930-1:1998 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

Annex A (normative)

Test for resistance to impact

A.1 Principle

This test is similar to that of BS EN 168:1995, clause 9, except that a squash ball is used as the projectile instead of a steel ball, and that the impact speed used differs from those given in BS EN 166:1996, Table 7.

A.2 Apparatus

The apparatus shall be in accordance with BS EN 168:1995, 9.1, but the steel ball shall be replaced by a standard yellow-dot squash ball.

A.3 Specimens

Four new specimens of the eye-protector are required.

A.4 Conditioning

A.4.1 Eye-protector

Place the specimens in a conditioning atmosphere at a temperature of $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and a relative humidity of $50\% \text{ r.h.} \pm 7.5\% \text{ r.h.}$ for a minimum of 4 h prior to the test.

A.4.2 Squash ball

Place a standard yellow-dot squash ball in a conditioning atmosphere at a temperature of $45\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ and a relative humidity of $10\% \text{ r.h.} \pm 7.5\% \text{ r.h.}$ for a period of 1 h. Remove the ball from the conditioning atmosphere no more than 3 min before commencing the test described in A.5.

A.5 Procedure

A.5.1 Perform the test in accordance with BS EN 168:1995, 9.2, but use the squash ball as the projectile at a speed of 40 m/s instead of the speeds specified in EN 166:1995, Table 7. Subject the specimens to impacts in accordance with A.5.2 to A.5.5, using a different specimen for each impact. The four impact points are defined in BS EN 168:1995, 3.2.3 and Figure 11.

A.5.2 Impact the first specimen once at the left frontal impact point from the side horizontal direction.

A.5.3 Impact the second specimen once at the right frontal impact point from the side horizontal direction.

A.5.4 Impact the third specimen once at the left side impact point from the front horizontal direction.

A.5.5 Impact the fourth specimen once at the right side impact point from the front horizontal direction.

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