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Ophthalmic optics — Spectacle frames — General requirements and test methods

Optique ophtalmique — Montures de lunettes — Exigences essentielles et méthodes d'essai

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75% of the member bodies casting a vote.

International Standard ISO 12870 was prepared by Technical Committee ISO/TC172 *Optics and optical instruments*, Subcommittee SC 7 *Ophthalmic optics and instruments*.

Annex A of this International Standard is for information only.

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Ophthalmic optics — Spectacle frames — General requirements and test methods

1 Scope

This International Standard specifies general requirements for unglazed spectacle frames designed for use with all prescription lenses, including tinted and untinted lenses, and is applicable to frames at the point of sale to the retailer.

It is applicable to all spectacle frame types, including rimless mounts, semi-rimless mounts, folding spectacle frames and spectacle frames made from natural organic materials (see 4.1).

NOTE See annex A for recommendations on the design of spectacle frames.

This International Standard is not applicable to products designed specifically to provide personal eye protection.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 105-B02:1994, *Textiles - Tests for colour fastness - Part B02: Colour fastness to artificial light: Xenon arc fading lamp test.*

ISO 3696:1987, *Water for analytical laboratory use - Specification and test methods.*

ISO 7998:1984, *Optics and optical instruments - Spectacle frames - Vocabulary and lists of equivalent terms.*

ISO 8596:1994, *Ophthalmic optics - Visual acuity testing - Standard optotype and its presentation.*

ISO 8624:1991, *Optics and optical instruments - Ophthalmic optics - Measuring system for spectacle frames.*

ISO 9456:1991, *Optics and optical instruments - Ophthalmic optics - Marking of spectacle frames.*

ISO 11380:1994, *Optics and optical instruments - Ophthalmic optics - Formers.*

ISO 11381:1994, *Optics and optical instruments - Ophthalmic optics - Screw threads.*

ISO 11715:–[1)], *Ophthalmic optics - Format of digital files for data transfer for profiling of spectacle lenses.*

1) To be published.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 7998 and the following definitions apply.

3.1 spectacle frame model: Spectacle frame produced to a common design, using the same materials (but not necessarily the same pigmentation) and surface treatment.

3.2 natural organic material: Material which has not been synthesized from other raw materials and, when processed, remains essentially in its original state.

NOTES

1 Processing in this case is defined as cutting, shaping, bending, polishing and heating.

2 Examples of natural organic materials are natural shell and wood.

4 Requirements

4.1 General

All spectacle frame types shall comply with the requirements identified as general (see tables 1 and 2), although other requirements are specific for certain spectacle frame types.

Table 1 — Requirements applicable to spectacle frames made from natural organic materials

	Subclause								
Frame type	**4.2 (*)**	**4.3**	**4.4**	**4.5 (*)**	**4.6**	**4.7**	**4.8 (*)**	**4.9**	**4.10 (*)**
Natural organic materials	+	0	0	+	0	0	+	0	+

(*) These subclauses give general requirements
\+ spectacle frame type shall comply with this subclause
0 compliance with this subclause is optional

4.2 Physiological compatibility
4.3 Measurement system
4.4 Dimensional tolerances
4.5 Tolerance on screw threads
4.6 Dimensional stability at elevated temperature
4.7 Mechanical stability
4.8 Resistance to perspiration
4.9 Resistance to optical radiation
4.10 Resistance to ignition

Table 2 — Requirements applicable to spectacle frames made from all other materials

	Subclause								
Frame type	**4.2 (*)**	**4.3**	**4.4**	**4.5 (*)**	**4.6**	**4.7**	**4.8 (*)**	**4.9**	**4.10 (*)**
Rimless mounts	+	0	0	+	+	0	+	+	+
Semi-rimless mounts	+	0	0	+	+	0	+	+	+
Folding spectacle frames	+	+	+	+	+	0	+	+	+
All other frames	+	+	+	+	+	+	+	+	+

(*) These subclauses give general requirements
\+ spectacle frame type shall comply with this subclause
0 compliance with this subclause is optional

4.2 Physiological compatibility
4.3 Measurement system
4.4 Dimensional tolerances
4.5 Tolerance on screw threads
4.6 Dimensional stability at elevated temperature
4.7 Mechanical stability
4.8 Resistance to perspiration
4.9 Resistance to optical radiation
4.10 Resistance to ignition

4.2 Physiological compatibility

The manufacturer shall exclude from spectacle frames any materials that are known to cause irritation, allergic or toxic reaction during wear in contact with the skin in a normal state of health, or during adjustment, amongst a significant proportion of users.

NOTE Rare or idiosyncratic reaction to any material may occur and may indicate the need for the individual to avoid particular types of material. Adverse skin reaction may be due to other causes, e.g. excessive contact pressure.

4.3 Measurement system

The stated nominal dimensions of the spectacle frame shall be in accordance with the measuring system specified in ISO 8624.

4.4 Dimensional tolerances

When measured with a linear measuring device having an accuracy of better than 0,1 mm, the following tolerances shall apply to the marked dimensions of the unglazed spectacle frame:

a) horizontal boxed lens size: ± 0,5 mm;

b) distance between lenses: ± 0,5 mm;

c) bridge width: ± 0,5 mm;

d) overall length of side: ± 2,0 mm.

The lens aperture shall be deemed to have the correct dimensions if the spectacle frame, when fitted with a lens machined using the appropriate former or geometrical data in compliance with the tolerance stipulated in 6.1, displays no change in the fit of the test lens subsequent to the test specified in 8.3.

4.5 Tolerance on screw threads

The tolerances on the screw threads used in the spectacle frame shall conform to ISO 11381.

4.6 Dimensional stability at elevated temperature

When the spectacle frame with test lenses fitted is tested in accordance with 8.2, the dimensions shall not alter by more than +6 mm or -12 mm. For small spectacle frames where the tip of the side is less than 100 mm from the back plane of the front, these tolerances are reduced to + 5 mm or - 10 mm.

4.7 Mechanical stability

4.7.1 Bridge deformation

When tested in accordance with 8.3, the spectacle frame with the test lenses fitted shall not

a) fracture at any point;

b) be permanently deformed from its original configuration by more than 2 % of the distance between the geometric centres of the spectacle frame.

4.7.2 Lens retention characteristics

The spectacle frame shall be considered to demonstrate acceptable lens retention characteristics if, when tested as described in 8.3, neither test lens is dislodged wholly or partially from its original location in the groove.

4.7.3 Endurance

When tested in accordance with 8.4, the spectacle frame with the test lenses fitted shall not

a) fracture at any point;

b) be permanently deformed from its original shape by more than 5 mm after 500 cycles;

c) require more than light finger pressure to open and close the sides.

NOTE A side should not close under its own weight at any point in the opening/closing cycle.

Item c) shall not apply to sides fitted with sprung joints.

4.8 Resistance to perspiration

When the spectacle frame is tested in accordance with 8.5, there shall be no

a) spotting or colour change after testing for 8 h; or

b) corrosion, surface degradation or separation of any coating layer

which is visible, without magnification, on the parts liable to come in contact with the skin during wear, under the inspection conditions described in 7.3.

4.9 Resistance to optical radiation

When the spectacle frame is tested in accordance with 8.6, there shall be no

a) colour change; or

b) loss of lustre on bright surfaces

when compared with an untested sample under the inspection conditions described in 7.3.

4.10 Resistance to ignition

When the spectacle frame is tested in accordance with 8.7, there shall be no continued combustion after withdrawal of the test rod.

5 Selection of specimens

The minimum level of conformity testing requires that two test specimens of each spectacle frame model be selected by an established random sampling technique. These specimens shall be identified as sample 1 and sample 2, and shall be conditioned as described in clause 6 before testing as described in clauses 7 and 8.

For the purposes of this International Standard, the spectacle frame model shall be deemed to have changed when the design, material or surface treatment has changed.

6 Preparation and conditioning

6.1 Test lenses

Prior to testing, both samples shall be fitted with a pair of special test lenses made of silicate glass with a vertex power of 0,00 D ± 0,25 D, a centre thickness of 2,25 mm ± 0,25 mm and a radius of curvature of the concave surface of 120 mm ± 20 mm. The test lenses shall be edged in accordance with either the former complying with ISO 11380 or the digital data complying with ISO 11715 supplied by the manufacturer of the spectacle frame to be tested. The bevel angle of the edged lens shall be $(120^{+3}_{-2})°$ for spectacle frames featuring a rim with a groove. When measured on every straight line through the boxed centre, the edged test lens shall not differ from the former or the digital data by more than 0,1 mm.

6.2 Sample conditioning and test conditions

Immediately before starting the series of tests, condition the test specimens, as-received from the manufacturer or supplier, for at least 4 h in an atmosphere maintained at a temperature of 23 °C ± 5 °C and a relative humidity of 50 % ± 10 %.

Carry out the testing in an atmosphere maintained within the same temperature and humidity ranges.

7 Testing, inspection and compliance

7.1 State of samples

Test the conditioned test specimens (6.2) as-received from the manufacturer or supplier, without prior realignment or adjustment.

7.2 Sequence of testing

Carry out the testing in the sequence specified in table 3. After completion of the endurance test, cut sample 2 in half at the bridge. Subject either half of the spectacle frame to the test for resistance to optical radiation (8.6), with the other half acting as a control for colour comparison purposes.

NOTE If a range of spectacle frame models is made from the same material(s) and with the same manufacturing procedures, it is acceptable to perform test sequences 6, 7 and 8 on only one of the spectacle frame models.

Table 3 — Sequence of testing

Identification of test	Require-ment clause	Test method clause	Sequence	Sample 1	Sample 2
Dimensional tolerance	4.3; 4.4		1		*
Dimensional stability	4.6	8.2	2	*	
Bridge deformation	4.7.1	8.3	3	*	
Lens retention	4.7.2	8.3	4	*	
Endurance	4.7.3	8.4	4		*
Resistance to perspiration	4.8	8.5	6	*	
Resistance to optical radiation	4.9	8.6	7		*
Resistance to ignition	4.10	8.7	8	*	
* Indicates the test shall be applied					

7.3 Inspection and examination

The inspection and examination of test samples shall be carried out, without the aid of a magnifying lens, by an observer with a visual acuity of at least 1,0, when tested using optotypes conforming to ISO 8596. Any required visual correction shall be worn for the observation distance.

During the examination, expose the test specimen to an illuminance of 1000 lx to 2000 lx and carry out the inspection against a matt black background.

7.4 Compliance

If both specimens of the spectacle frame model pass the tests as required in tables 1 and 2 selected from those specified in table 3, the product shall be deemed to comply with this International Standard.

If one specimen fails any test, a second set of two shall be tested. If both pass the tests as required in tables 1 and 2, the product shall be deemed to comply with this International Standard. If one or more tests in the sequence result in failure, the product shall be deemed not to comply with this International Standard. If two or more of the tests carried out on the first set of specimens result in failure, no second set shall be tested and the product shall be deemed not to comply with this International Standard.

8 Test methods

8.1 General

The test methods described are reference test methods. Variations or alternatives may be used provided that their results can be shown to be equivalent to those of the relevant reference method. In cases of dispute, the result obtained with the reference method shall have precedence.

8.2 Test for dimensional stability at elevated temperature

8.2.1 Apparatus

8.2.1.1 Test apparatus, consisting of a non-hermetic heating chamber with a temperature range from not less than ambient to +60 °C and fitted with a thermostat capable of controlling the temperature of the chamber to a tolerance of 3 °C.

8.2.1.2 Flat polished plate, of glass or metal, mounted in the chamber (8.2.1.1) either on, or parallel to, the base of the chamber.

8.2.1.3 Linear measuring device, having a measuring accuracy of better than 0,5 mm.

8.2.2 Procedure

8.2.2.1 In ambient conditions of 23 °C ± 5 °C, take the test specimen, with test lenses fitted and with the sides open to the fullest extent, and measure the distance between the side tips using the measuring device (8.2.1.3). Record this measurement as the pre-heating dimension, l_o.

8.2.2.2 Before commencing the test, stabilize the chamber at the test temperature.

Place the test spectacle frame on the plate (8.2.1.2), with the sides still open to the fullest extent, and with the top edge of the front and the top edge of the sides resting on the plate surface. Ensure that the spectacle frame is without contact with other samples or the chamber walls.

8.2.2.3 After the spectacle frame has reached the test temperature (i.e. when it has been in the heating chamber for 15 min ± 1 min at the appropriate setting), leave the spectacle frame undisturbed at the test temperature of 55 °C ± 5 °C for $2\,\mathrm{h}^{+5\,\mathrm{min}}_{0}$.

After this period, remove the spectacle frame still on the plate from the apparatus. Allow the spectacle frame to stabilize on the plate for a period of at least 2 h at 23 °C ± 5 °C and then repeat the measurement of the distance between the side tips as described in 8.2.2.1. Record this measurement as the post-heating dimension, l_1, and calculate the difference $l_1 - l_o$.

8.3 Bridge deformation test

8.3.1 Apparatus

The test apparatus consists of a vertically operating annular clamp, capable of holding the spectacle frame without twist or slip. The annular clamp has a diameter of 25 mm ± 2 mm, with two contact surfaces, E_1 and E_2, made of a firm elastic material (e.g. polyamide) and a downward-operating pressure peg D with a diameter of 10 mm ± 1 mm with the contact surface approximating a hemisphere. The clamping surfaces are capable of at least 10 mm separation equidistant either side of a horizontal line through the apparatus and the pressure peg is capable of travel from at least 10 mm above the horizontal line to not more than 8 mm below. The distance between the clamp and pressure peg is adjustable. The apparatus includes a linear measuring device having an accuracy of better than 0,1 mm.

8.3.2 Procedure

8.3.2.1 Mount the test specimen (sample 1) on the device with the sides of the spectacle frame extended and with the front of the spectacle frame downwards. Clamp the sample within a tolerance of 2 mm at the geometric centre of one lens (see figure 1).

Lower the pressure peg so that it rests on the back surface of the unclamped lens within 2 mm of its geometric centre, ensuring that there is no movement of the lens. Record this as the starting position.

Then move the pressure peg downwards slowly and smoothly, applying a force not exceeding 5 N, for a distance equal to (10 ± 1) % of the distance *c* between the lens centres (see ISO 8624).

8.3.2.2 If the maximum force of 5 N is insufficient to displace the pressure peg the required distance, continue the test but record the displacement that was attained.

Retain the initial displacement for 5 s and then return the pressure peg to its starting position. After a relaxation period of 20 s, again lower the pressure peg until it just rests on the lens.

8.3.2.3 Determine, in millimetres, the movement of the pressure peg from the starting position and calculate the percentage deformation using the following formula. Check that the spectacle frame shows no fracture.

$$\phi = \frac{x}{c} \cdot 100$$

where:

ϕ is the percentage deformation;
x is the movement of the pressure peg;
c is the boxed centre distance.

8.4 Endurance test

8.4.1 Apparatus

The test apparatus consists of two clamping devices mounted on universal joints, which are used to restrain the sides (see figures A.1 and A.2), and a bridge support (see figure 2). The bridge support has a diameter of 10 mm ± 1 mm with a rigid metal strip of thickness 1 mm ± 0,5 mm. The positions of the clamps and bridge support, relative to each other, are adjustable by at least 40 mm horizontally and vertically.

The apparatus is capable of continuously and smoothly imparting a cyclical motion to one of the universal joints of:

down 30 mm ± 0,5 mm - out 60 mm ± 1,0 mm - up 30 mm ± 0,5 mm

at a rate of 40 cycles per minute, with the other clamped side remaining fixed, except for the flexure of the universal joint.

8.4.2 Procedure

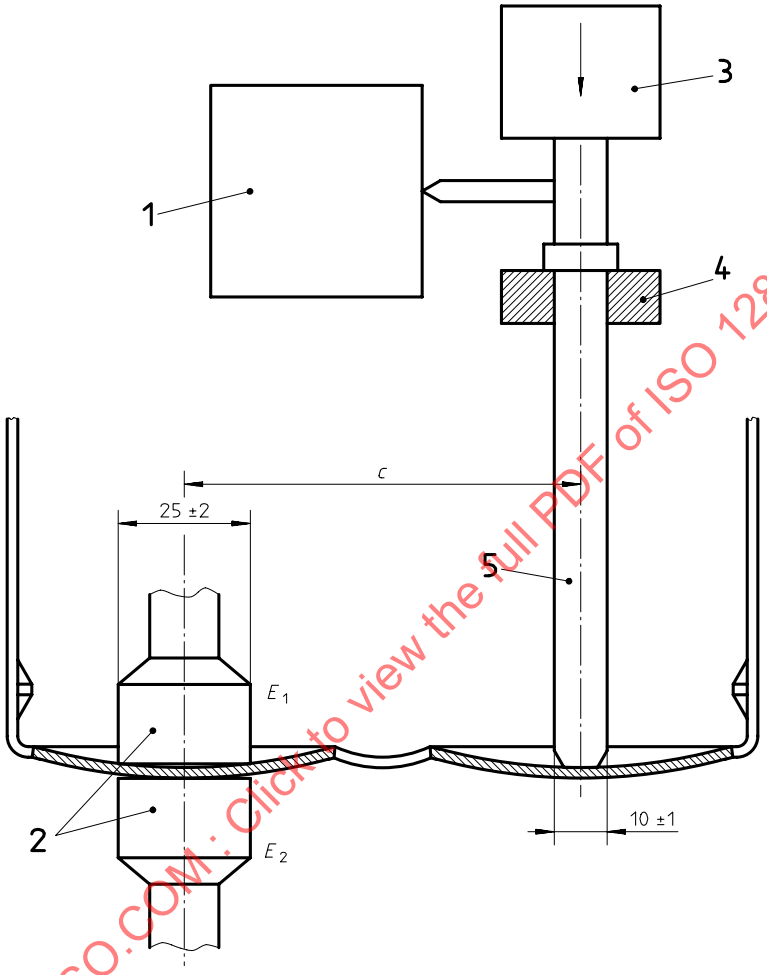
8.4.2.1 Before mounting the spectacle frame on the test apparatus, establish the clamping and measuring points.

Except for curl sides, ensure that the sides are clamped at a distance from the dowel screw centre equal to 70 % ± 1 mm of the overall side length. Each measuring point shall be 15 mm ± 1 mm nearer to the dowel screw than the clamping point.

For curl sides, ensure that the clamping points are 3 mm ± 1mm nearer to the dowel screw than the join between curl and the rigid side. Each measuring point shall be 10 mm ± 1 mm nearer to the dowel screw than the clamping point.

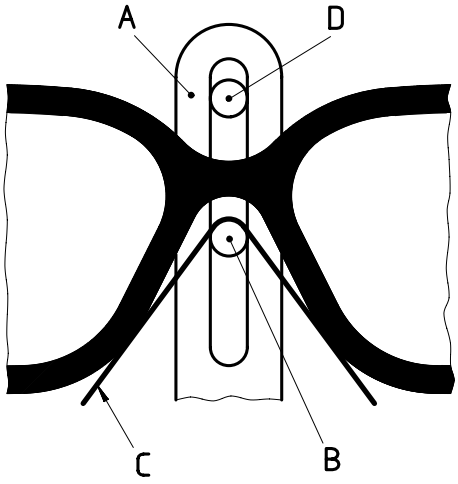
8.4.2.2 Before testing, open the sides of the spectacle frame to the fullest extent, without tension, and measure the distance between the sides at the pre-determined measuring points. Record this distance d_1.

Dimensions in millimetres



1 Measuring device
2 Annular clamp
3 Direction and point of application of force (maximum 5 N)
4 Travelling ring
5 Pressure peg D

Figure 1 — Bridge deformation test



A Vertical support with slot to facilitate height adjustment.

B Horizontal rod, located through a slot in vertical support A and fitted with a securing device to lock at the chosen height.

C Rigid metal strip, bent over horizontal rod B but free to pivot around the rod with the movement of the spectacle frame during the test.

D Restraining bar, located through a slot in vertical support A and fitted with a securing device to lock at the chosen height. This is required for certain spectacle frame models only.

Figure 2 — Detail of adjustable bridge support for endurance test rig

Mount the spectacle frame on the test device and ensure

a) that the rotating clamp M is on the same plane as fixed clamp R and that it is positioned at the nearest point of its rotation towards fixed clamp R (see figure A.2);

b) that the bridge of the spectacle frame is freely supported on the pivoting bridge support C (see figure A.2);

c) that the position of the restraining bar D is such that it does not clamp the bridge but merely prevents the spectacle frame lifting over the vertical support;

d) that the horizontal relationship between fixed clamp R, the bridge support and rotating clamp M are such that the spectacle frame may be mounted with sides fully open, but not under tension, and with the bridge support midway between the clamps;

e) that the height of the bridge support is adjusted so as to ensure that the sides are in line with the axis of the clamps and parallel to the base of the device;

f) that the sides are clamped within 1 mm of the calculated clamping point;

g) that lockscrew L is loosened to allow the fixed clamp R to align with the inward angle of drop of the side, and then retightened (see figure A.1);

h) the revolution counter is set to zero.

8.4.2.3 With the spectacle frame fitted with the test lenses in position, set the test device in motion, subjecting the sample to the cyclical rotating movement described in 8.4.1 for a total of 500 cycles.

After (500_0^{+1}) cycles have been completed, stop the motion and remove the sample from the test device. Measure the distance between the sides at the measuring point, and record the distance, d_2, in millimetres. Check that the difference between d_1 and d_2 does not exceed 5 mm.

Inspect the spectacle frame for fracture, breakage or change in side movement (see 4.7.2).

8.5 Test for resistance to perspiration

8.5.1 Apparatus

8.5.1.1 **Oven**, capable of a temperature range from not less than ambient to 60°C ± 3 °C.

8.5.1.2 **Glass cylindrical container**, with a diameter of 220 mm ± 20 mm and a height of 100 mm ± 10 mm, which is capable of being closed.

8.5.1.3 **Cotton wool**, commercially available.

8.5.1.4 **Water**, conforming to grade 3 of ISO 3696.

8.5.1.5 **Artificial sweat solution**, comprising:

a) lactic acid, ρ = 1,21 g/ml, > 88 % purity;
b) sodium chloride;
c) water, conforming to grade 3 of ISO 3696.

Using a suitable container, weigh 50 g of lactic acid and 100 g of sodium chloride; dissolve in 900 ml of water and make up to 1 l.

8.5.2 Procedure

8.5.2.1 Prepare a bed of cotton wool (8.5.1.3) on the base of the container (8.5.1.2). Pour the artificial sweat solution (8.5.1.5) evenly over the cotton wool and ensure that the cotton wool is thoroughly wet.

Place the test spectacle frame on the cotton wool, with the sides still open to the fullest extent, and with the top edge of the front and the top edge of the sides resting on the cotton wool. Ensure that the spectacle frame is without contact with other samples or the chamber walls.

Place each test sample, fitted with the test lenses, on the cotton wool bed, close the container and maintain at 55°C ± 5 °C.

8.5.2.2 After 8 h ± 30 min, remove each sample and immediately wash with the water (8.5.1.4) and then dry without rubbing, using a soft cloth.

8.5.2.3 Examine each sample without magnification, using the inspection conditions described in 7.3. By comparison with an identical untested spectacle frame, check for and record any spots or colour change.

8.5.2.4 Replace the samples on the cotton wool bed, close the container and maintain for a further 16 h ± 30 min at 55 °C ± 5 °C . After 24 h from the start of the test, remove, clean and dry the samples as described in 8.5.2.2.

8.5.2.5 Using the method described in 7.3, examine those areas of each sample which are liable to come into prolonged contact with the skin of the wearer. By comparison with an identical untested spectacle frame, check for and record any corrosion, surface degradation or separation of any coating layer.

8.6 Test for resistance to optical radiation

8.6.1 Apparatus

8.6.1.1 Xenon radiation apparatus, any commercially available type.

8.6.1.2 Standard radiation exposure medium, complying with ISO 105-B02.

8.6.2 Procedure

8.6.2.1 Before submitting the sample spectacle frame to the test, cut the sample into two parts at approximately the middle of the bridge. Retain one part to act as control for colour comparison purposes and insert the other part into the xenon radiation apparatus (8.6.1.1), together with the appropriate radiation exposure medium (8.6.1.2).

8.6.2.2 Submit each sample and the blue scale exposure medium to xenon radiation until grade 4 of the exposure medium is bleached to stage 4-5 of the grey scale. (See ISO 105-B02).

Switch off the radiation, remove each sample and inspect under conditions described in 7.3, ignoring any changes adjacent to the cut surface at the bridge.

Compare the exposed sample to the control sample and record as a failure if the exposed sample displays any of the changes specified in 4.9.

8.7 Resistance to ignition

8.7.1 Apparatus

8.7.1.1 Steel rod, 300 mm ± 3 mm long and 6 mm nominal diameter, with end faces which are flat and perpendicular to the longitudinal axis.

8.7.1.2 Heat source.

8.7.1.3 Thermocouple and temperature-indicating devices.

8.7.2 Procedure

8.7.2.1 Heat one end of the steel rod (8.7.1.1) over a length of at least 50 mm to a temperature of 650 °C ± 10 °C. Measure the temperature of the rod by means of the thermocouple (8.7.1.3) attached at a distance of 20 mm from the heated end of the rod.

8.7.2.2 Immediately place the heated face of the rod (positioned vertically with the heated end downwards) against the surface of the test sample (i.e. with the contact force equal to the weight of the rod) for a period of 5 s ± 0,5 s, and then remove the rod.

Repeat this test on each separate component of the spectacle frame.

8.7.2.3 Carry out a visual inspection following each stage to establish whether combustion continues after removal of the rod from the test sample.

9 Marking

Spectacle frames for which compliance with this International Standard is claimed shall be marked in accordance with ISO 9456, together with a reference to this International Standard ISO 12870.

10 Additional information to be supplied by the manufacturer or other person (agent) placing the product on the market

10.1 For each spectacle frame model, the manufacturer or his/her agent shall make available shape and size data to permit the accurate profiling of the lenses. The data shall be either:

a) capable of use with a physical lens edging former conforming to ISO 11380; or
b) presented digitally in a form complying with ISO 11715.

10.2 The manufacturer or his/her agent shall make available, with the spectacle frame, information with respect to particular processing conditions that may be required when fitting lenses or manipulating the spectacle frame for adjustment purposes.

10.3 In addition to the information specified in 10.1 and 10.2, the manufacturer or his/her agent should also make available, with the spectacle frame, the additional information recommended in annex A of ISO 9456:1991.

ANNEX A
(informative)

Recommendations for the design of spectacle frames

A.1 Design considerations

The spectacle frame should be designed to provide secure placement and retention of the lenses in the prescribed position relative to the eyes, and should be capable of being worn without discomfort for prolonged periods. It is therefore necessary that, in addition to meeting the requirements contained in this International Standard, the spectacle frame should have the following capabilities.

A.2 Materials

As well as being sufficiently stable to meet the requirements of clause 4, the materials used should also allow for professional adjustment at final fitting and should retain both their shape and relative position in wear. Materials should also resist degradation sufficiently to make the spectacle frame acceptable in use over a reasonable period.

A.3 Assembly

The method of assembly should ensure that unintentional separation of the various components from each other (for example, separation of sides from fronts or trims from fronts) cannot occur, either during fitting or in normal wear.

A.4 Range of sizes and facility for adjustment

In order to provide a comfortable fit on a wide range of wearers, the spectacle frame should be available in a minimum of two lens sizes, each in a minimum of two bridge widths.

Apart from the general need for adjustment identified in A.2, it should be possible to vary the side length on a given front. A minimum of three side lengths should be achievable, with 5 mm difference between each, for example by shortening of the side tips or by replacement of the whole side.

A.5 Mass

It is recommended that the mass of the unglazed spectacle frame should not exceed 32 g.

A.6 Contact areas

Areas of the spectacle frame that may, either by design or accident, come into contact with the wearer should be smooth, without sharp protuberances, and all edges should be rounded.

Areas intended as bearing surfaces should generally be as large as possible. In the case of pads and nasal bearing areas, it is recommended that these be:

a) at least 200 mm^2 for a spectacle frame weighing up to 25 g;

b) at least 250 mm^2 for a spectacle frame weighing over 25 g.

Security in wear may, in part, be provided by lateral pressure on the head and therefore the elasticity of both front and sides should be durable and contact surfaces again should be as large as possible.