INTERNATIONAL STANDARD

ISO 12870

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Ophthalmic optics — Spectacle frames — Requirements and test methods

Optique ophtalmique — Montures de lunettes — Exigences 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12870 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 7, *Ophthalmic optics and instruments*.

This second edition cancels and replaces the first edition (ISO 12870:1997), which has been technically revised. As this International Standard incorporates a revision of the text of ISO 9456:1991 that International Standard is also cancelled and replaced by the current edition of ISO 12870.

This corrected version of ISO 12870:2004 incorporates the following corrections: Figure B.2 has been modified.

Ophthalmic optics — Spectacle frames — Requirements and test methods

1 Scope

This International Standard specifies fundamental requirements for unglazed spectacle frames designed for use with all prescription lenses, and is applicable to frames at the point of sale to the retailer, by the manufacturer or supplier.

It is applicable to all spectacle frame types including rimless mounts, semi-rimless mounts and folding spectacle frames. This International Standard is applicable to spectacle frames made from natural organic materials.

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

This International Standard is not applicable to complete custom-made spectacle frames or to products designed specifically to provide personal eye protection.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 3160-1, *Watch-cases and accessories — Gold alloy coverings — Part 1: General requirements*

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

ISO 7998, *Optics and optical instruments — Spectacle frames — Vocabulary and lists of equivalent terms*

ISO 8596, *Ophthalmic optics — Visual acuity testing — Standard optotype and its presentation*

ISO 8624, *Ophthalmic optics — Spectacle frames — Measuring system and terminology*

ISO 11380, *Optics and optical instruments — Ophthalmic optics — Formers*

ISO 11381, *Optics and optical instruments — Ophthalmic optics — Screw threads*

ISO/TS 24348, *Ophthalmic optics — Spectacle frames — Method for the simulation of wear and detection of nickel release from coated metal and combination spectacle frames*

3 Terms and definitions

For the purposes of this document, the definitions given in ISO 7998 and ISO 8624 and the following 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 that has not been synthesized from other raw organic materials and, when processed, remains essentially in its original state

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

NOTE 2 Examples of natural organic materials are natural horn and wood.

3.3
custom-made spectacle frame
spectacle frame made to special order for a named patient

NOTE Examples of custom-made frames are those specially manufactured for wearers with unusual facial characteristics.

4 Requirements

4.1 General

The requirements applicable to the different types of spectacle frames are given in Table 1. All spectacle frame types covered by this International Standard shall comply with the requirements identified as general (g). Requirements marked "O" are optional, but may be required by legislation in some countries.

Table 1 — Requirements applicable to the different types of spectacle frames

Frame type	**Subclause** (see Note 1)									
	4.2.1	4.2.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	4.10
Rimless and semi-rimless mounts	g	O	O	O	g	g	g	g	g	O
All other spectacle frames (see Note 2)	g	O	g	g	g	g	g	g	g	O

Key

g Spectacle frame type shall comply with this subclause in order to pass this International Standard.

O Compliance with this subclause is optional.

4.2.1 General physiological compatibility

4.2.2 Nickel release

4.3 Measurement system

4.4 Dimensional tolerances

4.5 Tolerance on screw threads

4.6 Dimensional stability at elevated temperature

4.7 Resistance to perspiration

4.8 Mechanical stability

4.9 Resistance to ignition

4.10 Resistance to optical radiation

NOTE 1 Under European legislation, subclauses 4.2.1, 4.2.2, 4.5, 4.6, 4,7, 4.8 and 4.9 give fundamental requirements.

NOTE 2 "All other frame types" includes plastic and metal spectacle frames, including folding spectacle frames, having a rim completely surrounding the lens periphery.

4.2 Physiological compatibility

4.2.1 General physiological compatibility

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

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.

4.2.2 Nickel release

Those parts of metal and combination spectacle frames which come into direct and prolonged contact with the skin of the wearer shall have a nickel release of less than 0,5 µg/cm^2/week when tested in accordance with 8.8.

The parts to be tested shall include:

— the rear surface of rims;

— the rear and lower surface of the bridge, the rear and upper surface of any bracebar and any other nasal bearing surfaces, including metal nose pads;

— sides, excluding the joints and the zone immediately around the joints, and parts intended to be protected by plastics endcovers (tips).

Metal frames that are uncoated and made of homogeneous alloys or metals do not require a wear pre-treatment (such as specified in 8.8.2) and shall be tested directly in accordance with 8.8.3.

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 on nominal size

When measured with a linear measuring device having an accuracy of greater than 0,1 mm, the following tolerances shall apply to the marked dimensions of the unglazed spectacle frame using the boxed lens measurement method described in ISO 8624:

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.

To improve the accuracy of measurement of the overall length of side, it is recommended that the drop should be physically straightened. Sinuosity in the intended vertical plane, or pronounced curvature in the intended horizontal plane in the part of the side before the earbend should be ignored, see Figure 1. The overall length of the side should be taken as the length of the straight line between the dowel screw and the end of the side. Gentle bowing of the side to go round the width of the head should be straightened.

NOTE To simplify the edging of lenses for any single frame model, tighter tolerances in the lens aperture size from one frame to another of the same nominal size may be a matter of agreement between supplier and purchaser.

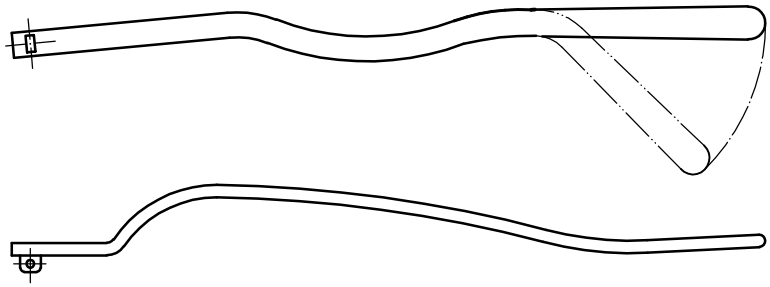


Figure 1 — Illustration of overall length of side

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 distance between the tips of the sides 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 Resistance to perspiration

When the spectacle frame is tested in accordance with 8.3, there shall be

a) no spotting or colour change anywhere on the frame, excluding joints and screws, after testing for 8 h and

b) no corrosion, surface degradation or separation of any coating layer on the parts liable to come into prolonged contact with the skin during wear, i.e. the insides of the sides, bottom and lower parts of the rim and the inside of the bridge, after testing for a total of 24 h.

Such defects shall be visible under the inspection conditions described in 7.2.

4.8 Mechanical stability

4.8.1 Bridge deformation

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

a) fracture or crack at any point;

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

4.8.2 Lens retention characteristics

The spectacle frame shall be considered to demonstrate acceptable lens retention characteristics if, when tested in accordance with 8.4, neither test lens is dislodged wholly or partially from its original location in the groove or mount.

4.8.3 Endurance

When tested in accordance with 8.5, the spectacle frame with the test lenses fitted shall not:

a) fracture at any point;

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

c) except for frames fitted with sprung joints, require more than light finger pressure to open and close the sides;

d) for frames that are not fitted with sprung joints, have a side that closes under its own weight at any point in the opening/closing cycle, or for sides with fitted with sprung joints, the side shall still support its weight in the open position (i.e. opened to the fullest natural extent without activating the spring mechanism).

4.9 Resistance to ignition

When the spectacle frame is tested in accordance with 8.6, there shall be no continued combustion after withdrawal of the test rod.

4.10 Resistance to optical radiation

When tested in accordance with 8.7, there shall be no

a) colour change greater than grade 3 of the grey scale in ISO 105-B02:1994, or

b) loss of lustre on bright surfaces,

when compared with an untested sample under the inspection conditions described in 7.2.

5 Selection of test samples

5.1 General

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

5.2 Testing for nickel release

For metal and combination spectacle frames, additional test samples 3 and 4 shall be selected by an established random sampling technique, and shall be conditioned as described in Clause 6 before testing as described in 8.8.

5.3 Change in spectacle frame model

If a range of spectacle frame models is made from the same material(s) and with the same manufacturing procedures including surface treatments, it is acceptable to perform test sequences 3 (subclause 8.3), 7 (subclause 8.6) and, if required, 8 (subclause 8.7) and/or 9 (subclause 8.8) on only one of the spectacle frame models.

6 Preparation and conditioning of test samples

6.1 Test lenses

Prior to testing for the requirements described in 4.6 to 4.10, test samples 1 and 2 shall be fitted with a pair of suitable test lenses.

NOTE These shall preferably be supplied or specified by the manufacturer. If these are not supplied or specified, then the following types shall be used depending upon the type of spectacle frame:

1) for rimless frames, organic lenses of polycarbonate with a vertex power of 0,00 D ± 0,25 D, a centre thickness of 2,00 mm ± 0,2 mm and a radius of curvature of the concave surface of 90 mm ± 10 mm;

2) for semi-rimless frames, organic lenses of allyl diglycol carbonate[1)] or polycarbonate with a vertex power of 0,00 D ± 0,25 D, a centre thickness of 2,00 mm ± 0,2 mm and a radius of curvature of the concave surface of 90 mm ± 10 mm;

3) for all other frame types, including folding and all rimmed spectacles, either organic lenses as in 2 above, or 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 100 mm ± 20 mm.

Prior to any wear pre-treatment for nickel release as specified in 4.2.2, test samples 3 and 4 shall be fitted with a pair of suitable organic lenses of power in the range − 1,00 D to + 1,00 D and edge thickness of between 1,5 mm and 2,5 mm.

For all test samples, these test lenses shall be edged either in accordance with the manufacturer's electronic instructions or using a digitally controlled edging machine following tracing of the individual test sample or, where appropriate, a mechanical former in accordance with ISO 11380.

The bevel angle of the edged lens shall be $(120, {}^{+3}_{-2})°$ for spectacle frames featuring a rim with a groove.

6.2 Sample conditioning and test conditions

Immediately before starting the series of tests, the test samples shall be conditioned for at least 4 h at an ambient temperature of 23 °C ± 5 °C, in the as-received condition from the manufacturer or supplier, without prior realignment, adjustment or lubrication.

Carry out the testing in an atmosphere maintained within the same temperature range.

7 Testing, inspection and compliance

7.1 Testing

The testing shall be carried out with the conditioned test samples (see 6.2) in the sequence specified in Table 2 at an ambient temperature of 23 °C ± 5 °C.

1) A trade name for this polymer is CR 39. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Table 2 — Sequence of testing

Identification of test	Requirement clause	Test method clause	Sequence	Sample 1	Sample 2	Samples 3 and 4
Dimensional tolerance	4.3; 4.4	4.4	1	*		
Dimensional stability	4.6	8.2	2	*		
Resistance to perspiration	4.7	8.3	3	*		
Bridge deformation	4.8.1	8.4	4		*	
Lens retention	4.8.2	8.4	5		*	
Endurance	4.8.3	8.5	6		*	
Resistance to ignition	4.9	8.6	7	*		
Resistance to optical radiation	4.10	8.7	8		*a	
Nickel release	4.2.2	8.8	9			*b
* Indicates that the test shall be applied.						
a This test is optional.						
b This test is a legal requirement in some countries, e.g. those in Europe.						

7.2 Inspection and examination

Where visual inspection is required, 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 visual correction required for the observation distance shall be worn.

During the examination, expose the test specimen to an illuminance of 1 000 lx to 2 000 lx and carry out the inspection against a matt black background.

7.3 Compliance

If all test samples of the spectacle frame model pass the tests specified in Table 1 and listed in Table 2, the product shall be deemed to comply with this International Standard (see Figure 2).

If either sample 1 or sample 2 fails any one of the tests in the complete test sequence, an additional sample shall repeat the test that was failed. If this additional sample passes the failed and subsequent tests specified in Table 1 and listed in Table 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 test samples result in failure, no additional samples shall be tested and the product shall be deemed not to comply with this International Standard.

In the case of non-compliance, this clause does not preclude resubmitting the frame for testing after improvements have been made to its design or manufacture.

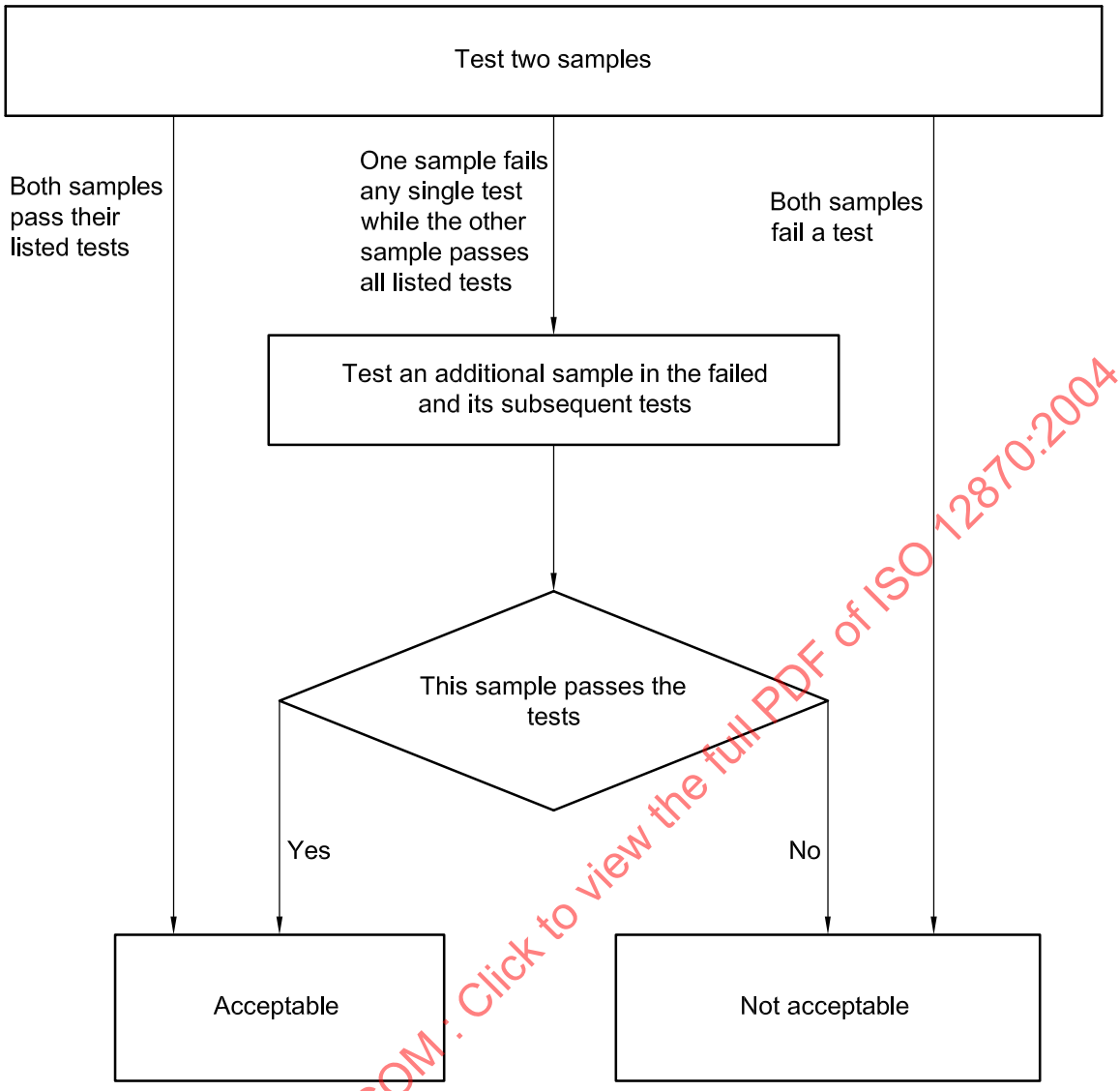


Figure 2 — Flow chart for compliance, excluding testing for nickel release

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 **Oven**, capable of producing the test temperature of 55 °C ± 5 °C.

8.2.1.2 **Flat polished plate**, of glass or metal, mounted in the oven (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 greater than 0,5 mm.

8.2.2 Procedure

8.2.2.1 At an ambient temperature of 23 °C ± 5 °C, take test sample 1, with test lenses fitted and with the sides open to the fullest extent (for frames with sprung joints, opened to the fullest natural extent without activating the spring mechanism), and measure the distance between the side tips using the measuring device (8.2.1.3). Record this measurement as the pre-heating value, l_0.

8.2.2.2 Before commencing the test, stabilize the oven (8.2.1.1) at the test temperature of 55 °C ± 5 °C.

Place the test sample 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. Place the sample on the plate in the oven, and ensure that the sample does not touch other samples or the oven wall.

8.2.2.3 When the test sample has reached the test temperature after approximately 15 min at the appropriate setting, leave it undisturbed at the test temperature for a further 2 h $^{+5\ \text{min}}_{0\ \text{min}}$.

After this period, remove the test sample, still on the plate, from the oven. Allow them to cool 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 value, l_1, and calculate the difference $l_1 - l_0$.

8.3 Test for resistance to perspiration

8.3.1 Apparatus and reagents

8.3.1.1 **Oven**, capable of producing the test temperature of 55 °C ± 5 °C.

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

8.3.1.3 **Volumetric flask**, 1 l, gauged to class A.

8.3.1.4 **Water**, conforming to Grade 3 of ISO 3696:1987.

8.3.1.5 **Artificial sweat solution**, comprising:

a) lactic acid, $\rho = 1{,}21$ g/ml, > 85 % purity;

b) sodium chloride (analytical reagent purity, ⩾ 99 %).

Impurities:

— Pb: ⩽ 0,001 0 %

— Fe: ⩽ 0,001 0 %

— Br: ⩽ 0,020 0 %

— I: ⩽ 0,010 0 %;

c) water, conforming to Grade 3 of ISO 3696:1987.

Using suitable containers, weigh 50 g ± 0,1 g of lactic acid and 100 g ± 0,1 g of sodium chloride and dissolve in 900 ml of water. Using the flask (8.3.1.3), make up to 1 l with water.

8.3.1.6 **Frame supports,** of glass or inert plastic, fitted in the container to enable the sample to be held above the artificial sweat solution (see Figure B.1).

8.3.2 Procedure

8.3.2.1 Cover the base of the container (8.3.1.2) with the artificial sweat solution (8.3.1.5) to a minimum depth of 10 mm so that the lowest part of the frame shall be 15 mm ± 3 mm above the solution.

Place test sample 1, fitted with the test lenses, on the supports (8.3.1.6), with the sides open to the fullest extent (for frames with sprung hinges, opened to the fullest natural extent without activating the spring mechanism), and with the bottom edges of the sides resting on the supports (see Figure B.1). Ensure that the spectacle frame does not touch other samples or the container walls.

Close the container, place it in the oven (8.3.1.1) and maintain at 55 °C ± 5 °C.

8.3.2.2 After 8 h ± 30 min, remove each sample and immediately wash with water (8.3.1.4) and then dry without rubbing, using a soft cloth.

8.3.2.3 Within 30 min, examine each test sample without the aid of magnification, using the inspection conditions described in 7.2. By comparison with an identical untested spectacle frame, check for and record any spots or change in colour.

8.3.2.4 Replace the test samples on the supports, close the container and maintain the test temperature of 55 °C ± 5 °C for a further 16 h ± 30 min. After completion of this second period, remove, clean and dry the samples as described in 8.3.2.2.

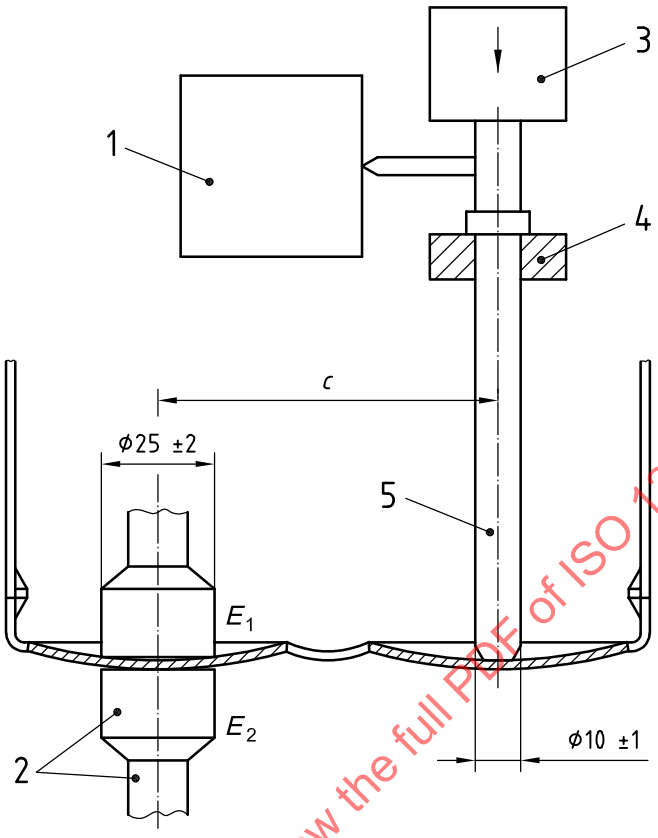
8.3.2.5 Within 30 min, examine those areas of each sample which are liable to come into prolonged contact with the skin of the wearer, using the inspection conditions described in 7.2. By comparison with an identical untested spectacle frame, check for and record any corrosion, surface degradation or separation of any coating layer.

8.4 Bridge deformation test

8.4.1 Apparatus

The test apparatus consists of a vertically operating annular clamp, capable of holding the test sample 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 with a downward operating pressure peg, D, of diameter 10 mm ± 1 mm with the contact surface an approximate 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 greater than 0,1 mm.

Dimensions in millimetres



Key

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 3 — Bridge deformation test

8.4.2 Procedure

8.4.2.1 Mount test sample 2 on the device with the sides of the test sample extended and with the front of the test sample downwards. Clamp the sample within a tolerance of 2 mm at the boxed centre of one lens (see Figure 3).

Lower the pressure peg so that it rests on the back surface of the unclamped lens within 2 mm of its boxed 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 boxed centre distance c (see ISO 8624).

8.4.2.2 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.

8.4.2.3 Determine, in millimetres, the movement, x, 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.

$$f = \frac{x}{c} \times 100$$

where:

f is the percentage deformation;

x is the movement of the pressure peg;

c is the boxed centre distance.

8.4.2.4 Using the inspection conditions described in 7.2, check that neither test lens has been dislodged wholly or partially from its original location in the groove or mount.

8.5 Endurance test

8.5.1 Apparatus

The test apparatus consists of two clamping devices mounted on universal joints, which are used to restrain the sides (see Figures B.2 and B.3), and a horizontal bar forming a bridge support (see 2 in Figure 4). The bridge support has a triangular cross section, enclosing an angle of 30° ± 2°, having a thickness at the top of 12 mm ± 1 mm with the upper edge approximately radiused.

The positions of the clamps and bridge support, relative to each other, are adjustable by at least 40 mm horizontally and vertically.

The universal joints shall not restrict the angular movement of the sides. The clamping point, defined as the edge of the clamp nearest the dowel screw centre, shall be 55 mm ± 1 mm from the centre of the pivot of the universal joint.

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

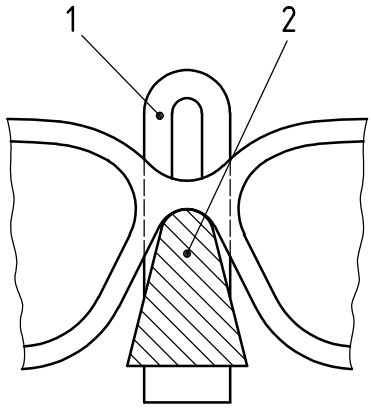
— down 30 mm ± 0,5 mm

— out 60 mm ± 1,0 mm

— up 30 mm ± 0,5 mm

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

NOTE For testing in frame development, manufacturers may wish to modify the test equipment so that either the right or the left side may be subject to the cyclical motion, the other remaining fixed.



Key

1 vertical support with slot to facilitate height adjustment

2 horizontal bar, located through a slot in the vertical support

Figure 4 — Detail of adjustable bridge support for endurance test rig

8.5.2 Procedure

8.5.2.1 Before mounting test sample 2 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 % of the overall side length ± 1 mm. 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 ± 1 mm 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.

8.5.2.2 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.

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 B.3);

b) that the bridge of the spectacle frame is freely supported on the bridge support, B (see Figures 4 and B.2);

c) that the horizontal relationship between clamp, R, the bridge support and 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;

d) 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;

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

f) that lockscrew, L, is loosened to allow the fixed clamp, R, to align with the inward angle of drop of the side, and then re-tightened (see Figure B.2);

g) that the revolution counter is set to zero.

8.5.2.3 With the test sample, fitted with the test lenses, in position, set the apparatus in motion, subjecting the sample to the cyclical rotating movement described in 8.5.1 for a total of (500, $^{+1}_{0}$) cycles.

After the 500 cycles have been completed, stop the motion and remove the sample from the apparatus. 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.

Under the inspection conditions described in 7.2, inspect the spectacle frame for fracture, cracks or change in side movement (see 4.8.3).

8.6 Test for resistance to ignition

8.6.1 Apparatus

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

8.6.1.2 **Heat source**.

8.6.1.3 **Thermocouple and temperature-indicating devices**.

8.6.1.4 **Timer**, capable of measuring an elapsed time of 10 s with an uncertainty no greater than ± 0,1 s.

8.6.2 Procedure

8.6.2.1 Heat one end of the steel rod (8.6.1.1) over a length of at least 50 mm to a temperature of 650 °C ± 20 °C. Measure the temperature of the rod by means of the thermocouple (8.6.1.3) attached at a distance of 20 mm ± 1 mm from the heated end of the rod. Press the heated face of the rod (positioned vertically with the heated end downwards) against the surface of test sample 1 (the contact force being 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 test sample 1.

8.6.2.2 Carry out a visual inspection during the test to establish whether the test sample ignites or continues to glow.

8.7 Test for resistance to optical radiation

8.7.1 Apparatus

8.7.1.1 **Xenon radiation apparatus**, either

a) specific xenon radiation apparatus, incorporating an ozone-free high pressure xenon lamp of 450 W nominal power stabilized at a lamp current of 25 A ± 0,2 A or

b) any commercially available xenon radiation apparatus.

New lamps shall be burnt in for at least 150 h before use.

NOTE Suitable lamp references are XBO-450 OFR and CSX-450 OFR [2].

2) XBO-450 OFR and CSX-450 OFR are examples of a suitable products available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products. Equivalent products may be used if they can be shown to lead to the same results.

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

8.7.1.3 **UV-B transmitting filter,** transmitting wavelengths above a cut-off at 270 nm.

8.7.2 Procedure

8.7.2.1 Place the UV-B filter (8.7.1.3) in the radiation apparatus [8.7.1.1 (a) or (b)] to shield the test sample from shorter wavelengths. Before submitting test sample 2 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. On the other part, separate the spectacle side from its front. Expose the front surface of the front and the outside surface of the side to xenon radiation as specified in 8.7.2.2. Carry out the determination with the test equipment operating at a temperature of 23 °C ± 5 °C

NOTE Forced ventilation will be necessary.

8.7.2.2 Either one of the following two procedures shall be followed:

a) Place that/those part(s) of test sample 2 used for testing, in the xenon radiation apparatus [8.7.1.1.a)]. Expose the sample for 25 h ± 0,1 h to radiation from the xenon lamp at a distance of 300 mm ± 10 mm measured from the axis of the lamp to the nearest point on the test sample(s). Ensure that the angle of incidence of the radiation on the sample's external surface is essentially perpendicular.

b) Place that part of test sample 2 used for testing in the xenon radiation apparatus [8.7.1.1.b)], together with the appropriate radiation exposure medium (8.7.1.2). 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-B02:1994.

8.7.2.3 Switch off the radiation, remove each sample and inspect under the conditions described in 7.2, 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 4.10.

8.8 Nickel release

8.8.1 Preparation

Spectacle sides and fronts shall be separated from each other, and endcovers (side tips) removed from sides where appropriate. If the spectacle frame is to be subject to the accelerated wear procedure given in 8.8.2, then, before testing, it shall be fitted with test lenses as specified in 6.1 in order to simulate normal wear.

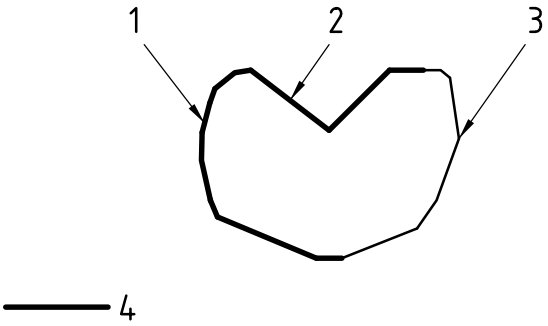
8.8.2 Procedure for accelerated wear before testing for nickel release

Before testing for nickel release, coated metal and metal combination frames shall be subject to the method for accelerated wear simulating two years use described in ISO/TS 24348.

NOTE An alternative and acceptable method is given in ENV 14027[3].

8.8.3 Procedure for testing for nickel release.

When the accelerated wear process is completed, remove the test samples and clean them with a smooth cloth without further damaging the surface with the abrasive. Only those parts of spectacle frames specified in 4.2.2 as coming into close and prolonged contact with the skin shall be tested for nickel release. Following tumbling, the samples shall therefore be masked with wax or lacquer to prevent nickel release from parts not specified as coming into close and prolonged contact with the skin before testing in accordance with ISO/TS 24348.



Key

1 front surface
2 inside surface
3 rear surface
4 mask

Figure 5 — Cross-section of rim showing those parts of the rim that need to be masked

NOTE 1 Parts typically needing masking are

- the pad arms;
- joints and the zone of the sides immediately surrounding these and parts intended to be covered by plastics endcovers (tips);
- the inside and front surfaces of rims (see Figure 5).
- the front and upper surface of the bridge and the front and lower surface of any brace bar
- the zones immediately around solder joints

To save masking pad arms and the areas around solder joints, the frame may be cut as shown in Annex C, and on the parts that are indicated for testing, the cut ends and the remaining surfaces not requiring testing masked.

NOTE 2 For convenience, manufacturers may test the bridge, rims and sides of frames without masking the inside and front surfaces of rims and the front and upper surfaces of the bridge and front and lower surfaces of any brace bar; if the item thus tested passes the nickel release requirement, then it is deemed that the surfaces specified for testing in 4.2.2 would pass.

NOTE 3 An alternative and acceptable method is given in EN 1811[1].

9 Marking

Spectacle frames shall be marked with the minimum information given in Table 3 and at the locations indicated.

Table 3 — Marking of spectacle frames

Marking	Location
Identification of manufacturer or supplier	Not specified
Model identification	Not specified
Colour identification	Not specified
Horizontal boxed lens size with box symbol ☐	On the front, whenever practicable
Distance between lenses	On the front, whenever practicable
Overall length of side	On the side
Specified order of marking of the dimensions of the front:  	
NOTE 1 All dimensions used are given in ISO 8624. NOTE 2 National legislation in some countries may require additional information, e.g. country of origin, to be marked on the frame.	

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

10.1 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.

10.2 The following information shall be made available in catalogues:

Range available (sizes and colours) including other side lengths available.

10.3 The following information shall be made available upon request:

a) vertical boxed lens size (dimension shown in ISO 8624);

b) bridge width (dimension shown in ISO 8624);

c) bridge height (dimension shown in ISO 8624);

d) effective diameter (dimension shown in ISO 8624);

e) components available separately.

11 Reference to ISO 12870

If the manufacturer or supplier claims compliance with this International Standard, reference shall be made to ISO 12870 either on the packaging or in available literature. Marking ISO 12870 on the frame is optional.

Any claim for compliance with those subclauses of this International Standard which are optional for the type of frame, e.g., 4.10, shall be accompanied by a reference to this International Standard: ISO 12870:2004.

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 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 on being worn. Materials should also resist degradation well enough to make the spectacle frame acceptable in use over a reasonable period.

The following information may be made available, either in documentation accompanying the frame, in catalogues or upon request:

— materials of the principal components, e.g. type of plastic and whether it has a protective coating;

— for metal frames, type of plating and whether it has a protective coating.

A.3 Assembly

The method of assembly should ensure that unintentional separation of the various components from each other (e.g., 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 a 5 mm difference between each, e.g., 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 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 the total area 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 on wearing 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 should be as large as possible.

A.7 Sprung joints

The spring tension of sprung joints should be approximately identical on both sides when the sides are subjected to identical deflection. The spring tension should be approximately proportional to the amount of deflection applied. The spring tensions should become active immediately at the side tip in the wearing position when the side is deflected out of its starting position.

A.8 Symmetry of spectacle frame

In a mirror-symmetric spectacle frame design, the let back of side, the angle of side and the overall side length should be the same.

A.9 Claims for material composition

A.9.1 If the frame is claimed to be nickel-release-safe or manufactured from rolled-gold or titanium material, then the materials used should comply with the following definitions.

A.9.2
nickel-release-safe metal or combination spectacle frame
frame that complies with 4.2.2

A.9.3
principal components of metal or combination spectacle frame
rims, bridge, lugs, sides and metal nose pads

NOTE For a frame of which the front is made from plastic materials, but the sides and/or lugs from metal, then the sides and/or lugs should be regarded as principal components.

A.9.4
non-principal components of metal or combination spectacle frame
all components of the spectacle frame which are not principal components

NOTE Typical non-principal components include joints, sprung joints, screws, closing blocks, solder, washers, bushings, nuts of screw assemblies, dowel pins, plastic nose pads, plastic coverings, plastic inner winding and cores of curl sides.

A.9.5
rolled-gold spectacle frame
frame in which each of the principal metal components is made of a material with a rolled-gold covering

A.9.6
rolled-gold covering
covering achieved with a method by which a layer of gold alloy is bonded to a sheet or bar of base metal, the whole then being subject to reduction by rolling

[ISO 3160-1]

NOTE 1 The proportion of gold should be designated as the nominal thickness in micrometres and the fineness of the gold alloy covering the base metal, e.g. 40 μm nominal thickness of 500 fineness gold alloy. In accordance with ISO 3160-1 the range of nominal thicknesses, in micrometres, are 5 – 10 – 20 – 40 – 80 – 100 – 120, with a tolerance of – 20 %, and the fineness is defined as the proportion of pure gold contained in the gold alloy, normally expressed in thousandths (41,67 thousandths = 1 carat).

NOTE 2 To clarify that the frame is made from rolled gold material, the initials L or RG may also be marked on the frame.

A.9.7
titanium spectacle frame
frame in which each of the principal metal components is made of an alloy containing at least 70 % titanium by weight

A.9.8
pure titanium spectacle frame
frame in which each of the principal metal components is made of an alloy containing at least 90 % titanium by weight