INTERNATIONAL STANDARD

ISO 8980-1

Fourth edition
2017-07

Ophthalmic optics — Uncut finished spectacle lenses —

Part 1: Specifications for single-vision and multifocal lenses

Optique ophtalmique — Verres de lunettes finis non détourés —
Partie 1: Spécifications pour les verres unifocaux et multifocaux

Reference number
ISO 8980-1:2017(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This fourth edition cancels and replaces the third edition (ISO 8980-1:2004), which has been technically revised. It also incorporates the Technical Corrigendum ISO 8980-1:2004/Cor.1:2006.

A list of all parts in the ISO 8980 series can be found on the ISO website.

Ophthalmic optics — Uncut finished spectacle lenses —

Part 1:
Specifications for single-vision and multifocal lenses

1 Scope

This document specifies requirements and verification methods for the optical and geometrical properties for uncut finished single-vision and multifocal spectacle lenses.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 7944, *Optics and optical instruments — Reference wavelengths*

ISO 8429, *Optics and optical instruments — Ophthalmology — Graduated dial scale*

ISO 8598-1, *Optics and optical instruments — Focimeters — Part 1: General purpose instruments*

ISO 8980-3, *Ophthalmic optics — Uncut finished spectacle lenses — Part 3: Transmittance specifications and test methods*

ISO 13666, *Ophthalmic optics — Spectacle lenses — Vocabulary*

ISO 14889, *Ophthalmic optics — Spectacle lenses — Fundamental requirements for uncut finished lenses*

ISO 21987, *Ophthalmic optics — Mounted spectacle lenses*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13666 and ISO 21987 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Classification

Uncut finished lenses are classified as follows:

a) single-vision finished lenses;

b) multifocal finished lenses;

c) power-variation finished lenses.

5 Requirements

5.1 Reference temperature

The tolerances shall apply at a temperature of 23 °C ± 5 °C.

5.2 Optical requirements

5.2.1 General

The optical characteristics shall be verified using a focimeter conforming to the requirements of ISO 8598-1.

The optical tolerances shall apply at the reference point(s) of the lens at one of the reference wavelengths specified in ISO 7944.

If the manufacturer states a verification power, then the ranges and tolerances in Table 1 to Table 4 shall be chosen according to and applied to the verification power. In this case, the verification power may be stated by the manufacturer on the package or in an accompanying document.

5.2.2 Back vertex power

When verified according to 5.2.1, spectacle lenses shall comply with the tolerances on the power of each principal meridian (see Table 1, second column), and with the tolerances on the cylindrical power (see Table 1, third to sixth column), using the method specified in 6.2.

Table 1 — Tolerances on the back vertex power of lenses

Values in dioptres (D)

Power of principal meridian with higher absolute back vertex power	Tolerance on the back vertex power of each principal meridian	Tolerance on the absolute cylindrical power			
		≥0,00 and ≤0,75	>0,75 and ≤4,00	>4,00 and ≤6,00	>6,00
≥0,00 and ≤3,00	±0,12	±0,09	±0,12	±0,18	—
>3,00 and ≤6,00	±0,12	±0,12	±0,12	±0,18	±0,25
>6,00 and ≤9,00	±0,12	±0,12	±0,18	±0,18	±0,25
>9,00 and ≤12,00	±0,18	±0,12	±0,18	±0,25	±0,25
>12,00 and ≤20,00	±0,25	±0,18	±0,25	±0,25	±0,25
>20,00	±0,37	±0,25	±0,25	±0,37	±0,37

5.2.3 Direction of the cylinder axis

When verified according to 5.2.1 and using the method specified in 6.3, the direction of the cylinder axis shall comply with the tolerances specified in Table 2. The cylinder axis shall be specified in accordance with ISO 8429.

These tolerances apply to multifocal lenses and to single-vision lenses with a predetermined orientation, e.g. prism base setting and/or position-specific single-vision lenses.

NOTE There are no requirements for the axis direction for cylindrical power of less than 0,12 D.

Table 2 — Tolerances on the direction of the cylinder axis

Absolute cylindrical power dioptres (D)	<0,12	≥0,12 and ≤0,25	>0,25 and ≤0,50	>0,50 and ≤0,75	>0,75 and ≤1,50	>1,50
Tolerance on the direction of the cylinder axis degrees (°)	No requirement	±14	±7	±5	±3	±2

5.2.4 Addition power for multifocal lenses

When verified according to 5.2.1 using the method specified in 6.5, the addition power shall comply with the tolerances specified in Table 3.

Table 3 — Tolerances on the addition power for multifocal lenses

Values in dioptres (D)

Value of the addition power	≤4,00	>4,00
Tolerance	±0,12	±0,18

5.2.5 Prismatic power

When verified according to 5.2.1 and using the method specified in 6.4, the total prism (including ordered and thickness reduction prism) shall comply with the tolerance(s) given in Table 4. Lenses with no ordered prism are also included.

To determine the prismatic power tolerances, find the value *S* of the higher absolute principal power. Then:

a) for single-vision lenses with no specific orientation, the row in Table 4 is chosen according to the value of the total prism and the tolerance selected from the second column;

b) for position-specific single-vision lenses and multifocal lenses:

   1) if ordered as an oblique prism, resolve any ordered prism into its horizontal and vertical components;

   2) determine the horizontal prism tolerances in the row in Table 4 according to the total horizontal prism component using the third column;

   3) determine the vertical prism tolerances in the row in Table 4 according to the total vertical prism component using the fourth column.

Table 4 — Prismatic tolerance

Values in prism dioptres (Δ)

Higher total prism component value	Type of lens		
	Single-vision	Multifocal and position-specific single-vision lenses	
		Horizontal component	Vertical component
≥0,00 and ≤2,00	±[0,25 + (0,1 × S)]	±[0,25 + (0,1 × S)]	±[0,25 + (0,05 × S)]
>2,00 and ≤10,00	±[0,37 + (0,1 × S)]	±[0,37 + (0,1 × S)]	±[0,37 + (0,05 × S)]
>10,00	±[0,50 + (0,1 × S)]	±[0,50 + (0,1 × S)]	±[0,50 + (0,05 × S)]
NOTE 1 S is the focal power, in dioptres, in the meridian of higher absolute principal power. NOTE 2 (0,1 × S) corresponds to the prismatic effect of 0,1 cm (1 mm) displacement, while (0,05 × S) corresponds to the prismatic effect of 0,05 cm (0,5 mm) displacement.			

NOTE An example of applying the tolerances in Table 4 to a distance power of +0,50 D sphere /−2,50 D cylinder axis 20° in a multifocal prescription with a prismatic power of not greater than 2,00 Δ is as follows:

For this prescription, the principal powers are +0,50 D and −2,00 D so that higher absolute principal power is 2,00 D. For a power of 2,00 D, the horizontal tolerance is ±[0,25 + (0,1 × 2,00)] = ±0,45 Δ. The vertical tolerance is ±[0,25 + (0,05 × 2,00)] = ±0,35 Δ.

5.2.6 Prism base setting

For position-specific single-vision and multifocal lenses, the tolerances on the base setting of any prism shall be determined by verifying that the horizontal and vertical components comply with Table 4.

5.3 Geometrical requirements

5.3.1 Requirements for size and thickness

Lens sizes are classified as follows:

a) nominal size (d_n): dimension(s), in millimetres, indicated by the manufacturer;

b) effective size (d_e): actual dimension(s), in millimetres, of the lens;

c) usable size (d_u): dimension(s), in millimetres, of the area that is optically usable.

For lenses specified by diameter, the tolerances on size shall be as follows:

— effective size, d_e:

$d_n - 1\ \text{mm} \leq d_e \leq d_n + 2\ \text{mm}$

— usable size, d_u:

$d_u \geq d_n - 2\ \text{mm}$

The tolerance on usable size does not apply for lenses with a carrier curve such as lenticulars.

The thickness of the lens may be specified by the manufacturer or be agreed between the orderer and the supplier.

The thickness shall be verified at the reference point of the front surface and normal to this surface. It shall not deviate from the ordered or agreed value by more than ±0,3 mm.

As the size and thickness of lenses worked for a particular shape and size will inevitably be subject to the requirements of the spectacle frame into which the lenses are to be mounted, the tolerances on size

and thickness are not applicable to these lenses. Such tolerances may be agreed between the orderer and supplier.

5.3.2 Requirements on segment dimensions for multifocal lenses

When using one of the methods specified in 6.6, each of the segment dimensions (width, depth and intermediate depth) shall not deviate from its nominal value by more than ±0,5 mm.

If sold as a matched pair, each of the segment dimensions (width, depth and intermediate depth) shall not differ by more than 0,7 mm.

5.4 Orientation requirement for polarizing lenses

Polarizing lenses intended for sun glare attenuation shall meet the requirements of ISO 8980-3.

6 Verification methods

6.1 General

Alternative verification methods are acceptable if shown to perform equivalently to the reference test methods in Clause 6.

NOTE Verification of the powers of spectacle lenses is dependent upon various parameters including those relating to the design of the focimeter, focusing errors and, particularly, lens positioning on the instrument. These apply especially for determining the near addition. For details, see ISO/TR 28980.

6.2 Verification method for back vertex power

Lenses shall be verified with the back surface of the lens against the focimeter's lens support. The lens shall be centred at the appropriate reference point. The back vertex power shall be verified according to Table 1.

6.3 Verification method for the direction of the cylinder axis

6.3.1 General

Lenses shall be verified with the back surface of the lens against the focimeter's lens support and the direction of the cylinder axis shall be verified according to Table 2.

6.3.2 Single-vision lenses

The tolerance on the direction of the cylinder axis is applicable only to position-specific single-vision lenses or to single-vision lenses with a predetermined orientation, e.g. prism base setting. In these cases, verify the direction of the cylinder axis, if applicable, in relation to the horizontal defined by the permanent alignment reference marking or to the prism base setting respectively.

6.3.3 Multifocal lenses

Verify the direction of the cylinder axis, if applicable, in relation to the horizontal in one of the following ways:

a) for round segment multifocal lenses, by the ordered segment position;

b) for non-round segment multifocal lenses, by the orientation of the segment.

6.4 Verification method for prismatic power

6.4.1 General

Lenses shall be verified with the back surface of the lens against the focimeter's lens support. The lens shall be centred at the reference point (the distance reference point for a multifocal lens). A prism-compensating device corresponding to the ordered or verification prismatic power and opposite base setting may be used. The prismatic power shall be verified according to Table 4.

6.4.2 Single-vision lenses (excluding position-specific single-vision lenses)

Verify the prismatic power.

6.4.3 Position-specific single-vision lenses

Verify the horizontal and vertical components in relation to the horizontal determined by the permanent alignment reference markings.

6.4.4 Multifocal lenses

Verify the horizontal and vertical components in relation to the horizontal in one of the following ways:

a) for round segment multifocal lenses, by the segment position prescribed on the lens order;

b) for non-round segment multifocal lenses, by the orientation of the segment.

6.5 Verification method for addition power

6.5.1 General

The addition power shall be verified according to Table 3.

The surface on which the segment is located shall be chosen as the reference surface, in this subclause 6.5 only, for verification of the addition power.

Alternatively, the manufacturer may nominate which surface of the lens shall be used as the reference surface.

NOTE Differences can occur between measurements made with different focimeters at points on a lens where prism is not zero. This is because of effects in the measurement, such as different focimeter designs, the non-linearity error of focimeters, the positioning of the lens or the amount of tilt when the lens is placed on the support and the subjective focusing error.

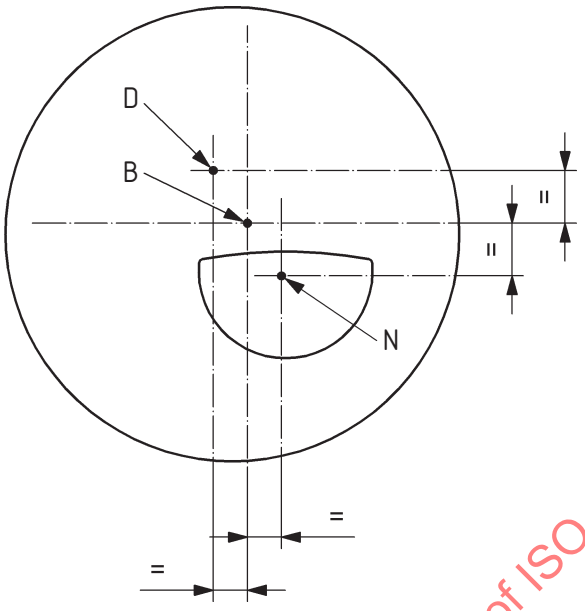
6.5.2 Procedure

Establish point D, which is the symmetrical of point N with respect to point B (see Figure 1). If the position of point N is not specified, choose a point 5 mm below the segment top as point N.

Place the lens so that the reference surface is against the focimeter's lens support, position the lens at point N and measure the near power.

Keeping the reference surface against the focimeter's lens support, position the lens at point D unless point B is stated by the manufacturer and measure the distance power.

Calculate the addition power as the difference between the near power and the distance power. These powers may be either the power measured using the nearer-to-vertical lines of the target or the spherical equivalent power.



Key

B distance reference point

D verification point for distance power

N verification point for near power

Figure 1 — Verification of addition power

6.6 Verification method for segment size

Using a shadowgraph, an optical comparator fitted with the appropriate graticule or a precision measuring instrument, measure the segment dimensions (width, depth and intermediate depth) in the tangential plane to the centre of the segment.

6.7 Inspection method for material and surface quality

Material and surface quality can be assessed using the method in Annex A.

7 Marking requirements for single-vision lenses

7.1 Position-specific single-vision lenses

Position-specific single-vision lenses shall have permanent alignment reference marking comprising two marks located nominally 34 mm apart, equidistant to a vertical plane through the fitting point or prism reference point.

7.2 Polarizing lenses

Polarizing finished lenses with no other geometric orientation features shall include permanent or non-permanent marking on the horizontal meridian to identify clearly the intended horizontal orientation. Alternatively, if manufacturers or suppliers choose to include marking on the vertical meridian of the finished lenses to indicate the plane of transmission, this shall be clearly identified.

8 Identification and information

The information to be stated by the manufacturer on the package of the spectacle lens or in an accompanying document shall comply with ISO 14889.

The information to be made available on request shall comply with ISO 14889.

9 Reference to this document

If the manufacturer or supplier claims compliance with this document, reference shall be made to this document either on the package or in the available literature.