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Ophthalmic optics — Semi-finished spectacle lens blanks —

Part 2: Specifications for progressive-power and degressive-power lens blanks

Optique ophtalmique — Verres de lunettes semi-finis —

Partie 2: Spécifications pour les verres progressifs et dégressifs

Reference number
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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

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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.

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 172, *Optics and photonics*, Subcommittee SC 7, *Ophthalmic optics and instruments*.

This fourth edition cancels and replaces the third edition (ISO 10322-2:2006), which has been technically revised.

ISO 10322 consists of the following parts, under the general title *Ophthalmic optics — Semi-finished spectacle lens blanks*:

— *Part 1: Specifications for single-vision and multifocal lens blanks*

— *Part 2: Specifications for progressive-power and degressive-power lens blanks*

Introduction

Compared with previous editions of this part of ISO 10322, the scope now includes degressive-power semi-finished lens blanks.

Ophthalmic optics — Semi-finished spectacle lens blanks —

Part 2: Specifications for progressive-power and degressive-power lens blanks

1 Scope

This part of ISO 10322 specifies requirements for the optical and geometrical properties of semi-finished lens blanks with finished progressive-power and degressive-power surfaces.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 13666, *Ophthalmic optics — Spectacle lenses — Vocabulary*

3 Terms and definitions

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

4 Classification

Semi-finished lens blanks (shortened to lens blanks in the remainder of this part of ISO 10322 for easier reading) are classified according to the finished surface as follows:

a) single-vision lens blanks;

b) multifocal lens blanks;

c) progressive-power and degressive-power lens blanks.

5 Requirements

5.1 General

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

5.2 Optical requirements for the finished surface

5.2.1 General

The optical tolerances shall apply to the manufacturer's stated values at the reference points of the lens blank at one of the reference wavelengths specified in ISO 7944.

The optical tolerances in Table 1 and Table 2 are expressed as surface power values, in dioptres, in the refractive index of the material of the lens blank being measured.

5.2.2 Tolerances on the surface power

The tolerances on the surface power as specified in Table 1 shall apply at the distance reference point of progressive-power lenses and at the near reference point of degressive-power lenses and shall be measured using the method described in 6.2.

Table 1 — Tolerances on the surface power

Values in dioptres (D)

Surface power	Tolerance on the surface power $\frac{F_1 + F_2}{2}$	Tolerance on surface cylindrical power[a] $\lvert F_1 - F_2 \rvert$
≥0,00 and ≤10,00	±0,09	0,09
>10,00 and ≤15,00	±0,12	0,12

NOTE F_1 and F_2 are the maximum and minimum values of the surface power expressed in the refractive index of the material.

[a] Relative to zero, or to any intended surface cylindrical power of the lens blank's design.

5.2.3 Tolerances on the surface addition power for progressive-power lens blanks

The tolerances on the surface addition power as specified in Table 2 shall apply at the reference points and shall be measured using the method described in 6.3.

Table 2 — Tolerances on the surface addition power

Values in dioptres (D)

Surface addition power	Tolerance
≤4,00	±0,12
>4,00	±0,18

5.3 Geometrical tolerances

5.3.1 Tolerances on the size

The 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;

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

1) effective size, d_e:

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

2) usable size, d_u:

$d_u \geq d_n - 1 \text{ mm}$ for $d_n \leq 65 \text{ mm}$;

$d_u \geq d_n - 2 \text{ mm}$ for $d_n > 65 \text{ mm}$.

The tolerance on usable sizes does not apply to lens blanks for lenses with a carrier curve, such as lenticulars.

5.3.2 Tolerances on thickness

5.3.2.1 Centre thickness

The centre thickness, when measured at the geometric centre (unless otherwise stated by the manufacturer), shall be neither less than the minimum thickness stated by the manufacturer nor exceed this minimum thickness by more than 3 mm.

5.3.2.2 Edge thickness

When measured at the point stated by the manufacturer, the edge thickness shall be neither less than the minimum thickness stated by the manufacturer nor exceed this minimum thickness by more than 3 mm.

5.4 Orientation requirement for polarizing lens blanks

For polarizing lens blanks intended for sun glare attenuation, the plane of transmission shall be aligned to the permanent alignment reference markings at 90° ± 3°.

6 Test methods

6.1 General

Alternative measurement methods are acceptable if shown to perform equivalently to the reference test methods in 6.2 to 6.4.

6.2 Determination of surface power

Surface power at the reference point shall be determined using a suitable instrument capable of measuring surface power, by reflection, with an accuracy that is appropriate to the tolerances listed in Table 1.

The optical tolerances in Table 1 are expressed as surface power values, in dioptres, in the refractive index of the material of the lens blank being measured.

NOTE 1 Some surface power instruments allow setting of the reference refractive index to match that of the actual lens blank being measured. Conversion might be required to establish the tolerance values if the lens blank is measured with equipment calibrated for a different reference refractive index (see Annex B).

NOTE 2 It might be necessary to use a device that limits the aperture of measurement. The recommended range for the measurement aperture is 4 mm to 8 mm.

6.3 Surface addition power measurement for progressive-power lens blanks

6.3.1 General

Surface addition power shall be measured using a suitable instrument capable of measuring surface power, by reflection, with an accuracy that is appropriate to the tolerances listed in Table 2. Measure the powers at the distance reference point and at the near reference point.

NOTE The test method for determining addition power requires the measurement of surface addition power.

When no surface measurement capability exists, an alternative method for addition power measurement using a focimeter is provided in Annex C.

6.3.2 Measurement

The surface chosen for measurement shall be the progressive side. Measure the power at the near and distance reference points, and calculate the addition as the difference between the powers at these points. The powers at the distance and near reference points should be taken as the mean of the principal meridional surface powers.

6.4 Inspection method for material and surface quality

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

7 Marking and identification

7.1 Marking

7.1.1 Permanent marking

The lens blank shall be permanently marked on the finished surface with at least the following:

a) alignment reference markings comprising two marks located 34 mm apart, equidistant to a vertical plane through the fitting point or prism reference point; in special cases, the alignment reference marking may be applied only after finishing the second surface;

b) for progressive-power lens blanks, an indication of the addition power in dioptres (under the temporal alignment reference mark); in special cases, the addition power marking may be applied only after finishing the second surface;

   For degressive-power lens blanks, if available in more than one degression power, an appropriate indication shall be given by the manufacturer;

c) indicator of the manufacturer or supplier, or the trade name or trademark.

7.1.2 Optional non-permanent marking

The following optional non-permanent marking is recommended:

a) alignment reference marking;

b) for progressive-power lens blanks, the indicator of the distance reference point;

c) indicator of the near reference point;

d) indicator of the fitting point;

e) indicator of the prism reference point, where applicable.

7.2 Identification required on the package

The lens blank shall be supplied in a package. The package shall be labelled with at least the following information (see also Clause 8):

a) nominal surface power, in dioptres;

b) nominal surface cylindrical power, in dioptres, and orientation (if applicable);

c) nominal size, in millimetres;

d) colour (if not clear);

e) identification of any coating;

f) material of which the lens blank is made, its refractive index or the trade name indicating the material or equivalent;

g) for progressive-power lens blanks, the addition power, in dioptres; for degressive-power lens blanks, if available in more than one degression power, an appropriate indicator;

h) style designation or trade name or trademark;

i) an indicator stating right or left lens (if applicable).

7.3 Information to be made available

The following information shall be available on request:

a) minimum centre thickness, in millimetres, and, if not measured at the geometric centre, where it is measured (see 5.3.2.1);

b) minimum edge thickness, in millimetres, and identification of the measurement point (see 5.3.2.2);

c) radius of curvature both of the finished surface (measured at the distance reference point for progressive-power surfaces and at the near reference point for degressive-power surfaces) and of the unfinished surface, in millimetres;

d) optical properties of the material;

e) method of measurement of the addition power used by the manufacturer including reflection or transmission method, and if applicable, focimeter type;

f) prism thinning (if applicable);

g) centration chart for reconstruction of the non-permanent markings relative to the permanent markings;

h) for surfaces with intended surface cylindrical power, the magnitude and orientation of the intended surface cylindrical power, and, if applicable, the tolerance on the direction of the cylinder axis.

8 Reference to this part of ISO 10322

If the manufacturer or supplier claims compliance with this part of ISO 10322, reference shall be made to ISO 10322-2, either on the package or in the available literature.

Annex A
(informative)

Material and surface quality

A.1 Assessment

A.1.1 Finished surface

The lens blank should not exhibit any defect either internally or on the finished surface which might impair vision. Small isolated material and/or surface defects not likely to impair vision may be acceptable.

A.1.2 Unfinished surface

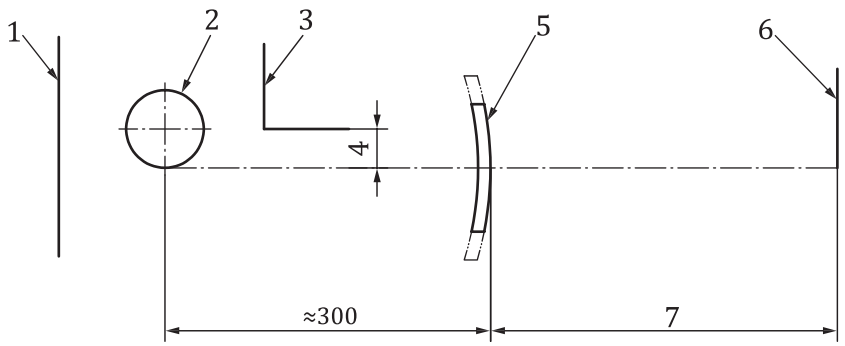
The surface quality of the unfinished surface should be sufficient to allow marking, inspection and measurement.

A.2 Test method

Carry out the inspection at a light/dark boundary and without the aid of magnifying optics. The recommended system is shown in Figure A.1. Inspect the lens blank within a room with ambient lighting of about 200 lx. Use a source of at least 400 lm as an inspection lamp, for example a fluorescent tube of 15 W or a partly shaded 40 W incandescent clear lamp.

NOTE This observation is subjective and requires some experience.

Dimensions in millimetres



Key

1 matt black background (150 × 360)
2 light source, ≥400 lm
3 diaphragm
4 adjustable opaque mask
5 movable lens blank
6 plane of the observer's eye
7 unobstructed vision

NOTE The diaphragm is adjusted to shield the eye from the light source and to allow the lens blank to be illuminated.

Figure A.1 — Recommended system for visually inspecting a lens blank for defects

Annex B
(informative)

Conversion of surface power tolerances from the refractive index of the lens blank to that of an instrument's fixed reference

The surface power values and tolerances in this part of ISO 10322 are expressed as units of surface power in dioptres with respect to the refractive index of the material using Formula (B.1):

$$\text{Power}\left(\text{dioptres}\right) = \frac{\left(\text{Refractive index} - 1\right) \times 1\,000}{\text{Radius of curvature}\left(\text{mm}\right)} \tag{B.1}$$

Some surface power instruments allow setting of the refractive index to match that of the actual lens blank. If only a single reference index, n_R, (e.g. 1,530) is used by the instrument, it might be necessary to use a conversion table such as the one below to determine the appropriate tolerance value. For example, if a material has a refractive index, n_S, of 1,660 and the surface power tolerance is ±0,09 D, then the error in radius giving this power error will generate a smaller power error indication when measured with an instrument set to a refractive index of 1,530. The values for the tolerance to be applied as indicated by the instrument, in this case, the reduced value of ±0,072 D shown in Table B.1, are obtained using Formula (B.2):

$$\text{Tolerance to be applied} = \text{tolerance expressed in refractive index of blank material} \times \frac{\left(n_R - 1\right)}{\left(n_S - 1\right)} \tag{B.2}$$

Table B.1 — Example of a table for tolerance value conversion for an instrument using a fixed reference refractive index of 1,530

Values in dioptres (D)

Tolerance expressed in the refractive index of blank material	Tolerance to be applied when instrument reference refractive index (n_R) is 1,530				
	Examples for the refractive index of the lens blank (n_S)				
	1,499	1,586	1,600	1,660	1,740
0,04	0,042	0,036	0,035	0,032	0,029
0,05	0,053	0,045	0,044	0,040	0,036
0,06	0,064	0,054	0,053	0,048	0,043
0,07	0,074	0,063	0,062	0,056	0,050
0,08	0,085	0,072	0,071	0,064	0,057
0,09	0,096	0,081	0,080	0,072	0,064
0,10	0,106	0,090	0,088	0,080	0,072
0,11	0,117	0,099	0,097	0,088	0,079
0,12	0,127	0,109	0,106	0,096	0,086
0,15	0,159	0,136	0,133	0,120	0,107
0,18	0,191	0,163	0,159	0,145	0,129
0,25	0,266	0,226	0,221	0,201	0,179

Annex C
(informative)

Addition power measurement by transmission

C.1 General

This Annex is provided as an alternative addition power measurement method where a focimeter is used to determine addition power.

Addition power shall be measured using a focimeter meeting the requirements of ISO 8598-1.

The surface chosen for measurement shall be the progressive side unless otherwise stated by the manufacturer, in which case the specified surface shall be placed on the focimeter's lens support.

NOTE 1 Differences can occur between measurements made with different focimeters at points on a lens blank 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 blank, and the amount of tilt when the lens blank is placed on the support and the subjective focusing error.

NOTE 2 It might be necessary to use a device that limits the aperture of measurement. The recommended range for the measurement aperture is 4 mm to 8 mm.

C.2 Method

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

Keeping the chosen surface against the focimeter support, centralize the lens blank at the distance reference point and measure the distance power.

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

The tolerances as specified in Table 2 still apply to the transmitted addition power when using this method.

Bibliography

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

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