
**Ophthalmic instruments — Trial case
lenses**

Instruments ophtalmiques — Verres de boîte 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 9801 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 9801:1997), which has undergone a minor revision to update normative references and to include a second standard diameter (see 4.3.2).

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Ophthalmic instruments — Trial case lenses

1 Scope

This International Standard specifies requirements for mounted ophthalmic full and/or reduced aperture trial case lenses for the determination of the refractive error of the eye.

This International Standard takes priority over ISO 15004-1, if differences exist.

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 7944, *Optics and optical instruments — Reference wavelengths*

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

ISO 15004-1:2006, *Ophthalmic instruments — Fundamental requirements and test methods — Part 1: General requirements applicable to all ophthalmic instruments*

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3 Terms and definitions

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

3.1

trial case lens

lens, in a mount, used to assess the refractive error of the human eye

3.2

full-aperture trial case lens

trial case lens with a protective mount of maximal practical wall thickness of approximately 1 mm, allowing the maximum available free lens aperture

3.3

reduced-aperture trial case lens

trial case lens with the designated free lens aperture significantly less than the mount outer diameter, allowing for considerable reductions in lens thicknesses to be made

3.4

additive power trial case lens set

train of spherical, cylindrical or spherocylindrical combination of trial case lenses, in which the measured back-vertex power at the last surface equals the meridional sums of the labelled values of the train lenses when each element is placed in its specified frame cell

NOTE See ISO 12867.

**3.5
lens power**

⟨spherical lens⟩ back-vertex power, expressed in dioptres (D)

**3.6
lens power**

⟨cylindrical lens⟩ back-vertex power in the principal meridian not equal to zero, expressed in dioptres (D)

NOTE Cylindrical trial case lenses have one principal meridian with zero power.

**3.7
prismatic power**

⟨prismatic lens, prism⟩ prismatic effect, measured as the displacement, in centimetres, of the light ray in a plane perpendicular to its line of incidence on the lens at a distance of 1 m

NOTE 1 Prismatic power is expressed in prism dioptres (Δ).

NOTE 2 The prism base is marked by a line or triangle on the mount (see Clause 6). The position of the prism base is indicated according to ISO 8429.

4 Requirements

4.1 General

The trial case lenses shall conform to the requirements specified in ISO 15004-1. Conformity to the requirements specified in 4.2, 4.3 and 4.4 shall be verified as described in Clause 5.

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4.2 Optical requirements

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The trial case lenses shall conform to the requirements specified in Tables 1 to 6. Conformity to these requirements shall be verified as described in 5.2.

The dioptric powers indicated in Tables 1 to 4 shall be referenced to the wavelength $\lambda = 546,07$ nm or alternatively $\lambda = 587,56$ nm, in accordance with ISO 7944.

If the requirements are not met for both wavelengths, the reference wavelength used shall be indicated.

The requirements for lenses with nominal zero power (plano) are given in Table 1.

Table 1 — Tolerances on lenses with zero power

Nominal lens power	Tolerance on		
	mean power	residual astigmatism	prismatic power
D	$\frac{S_1 + S_2}{2}$ D	$ S_1 - S_2 $ D	Δ
0	±0,03	0,03	0,06
NOTE S_1 and S_2 refer to the vertex powers in the principal meridians.			

The requirements for lenses with spherical power are given in Table 2.

Table 2 — Tolerances on lenses with spherical power

Nominal spherical power (absolute)	Tolerance on	
	mean power $\frac{S_1 + S_2}{2}$	residual astigmatism $ S_1 - S_2 $
D	D	D
0,12	±0,03	0,03
> 0,12 to 6,00	±0,06	0,03
> 6,00 to 12,00	±0,09	0,03
> 12,00	±0,12	0,03

NOTE S_1 and S_2 refer to the vertex powers in the principal meridians.

The requirements for lenses with cylindrical power are as follows:

- a) The tolerances in the afocal principal meridian shall be ±0,03 D and 0,12 Δ.
- b) The tolerances on the cylindrical power principal meridian are given in Table 3.

Table 3 — Tolerances on lenses with cylindrical power

Nominal cylindrical power	Tolerance
0,12	±0,03
> 0,12 to 1,00	±0,06
> 1,00 to 4,00	±0,09
> 4,00 to 6,00	±0,12
> 6,00	±0,18

The requirements for lenses with prismatic power are given in Table 4.

Table 4 — Tolerances on lenses with prismatic power

Prismatic power		Tolerance	
nominal	tolerance	spherical	astigmatic
≤ 6	±0,12	±0,03	0,03
> 6	±0,25	±0,03	0,03

The accuracy of the optical centring of spherical and cylindrical lenses shall be as given in Table 5.

Table 5 — Tolerances on centration

Nominal lens power (absolute) D	Tolerance on Δ at the geometric centre of the mount
$\geq 0,12$ to 2,00	$\pm 0,12$
$> 2,00$ to 5,00	$\pm 0,25$
$> 5,00$ to 8,00	$\pm 0,38$
$> 8,00$ to 12,00	$\pm 0,50$
$> 12,00$	$\pm 0,75$

The accuracy of the positions of the cylinder axis or the prism base in relation to their corresponding marks (see Clause 6) shall be as given in Table 6.

Table 6 — Tolerances on the marking of the cylinder axis and the prism base

	Nominal cylindrical power D	Tolerance
Lenses with cylindrical power	$\leq 0,25$	$\pm 3^\circ$
	$> 0,25$ to 0,50	$\pm 2^\circ$
	$> 0,50$	$\pm 1^\circ$
	Nominal prismatic power Δ	Tolerance
Lenses with prismatic power	$\leq 0,5$	$\pm 7^\circ$
	$> 0,5$ to 1,0	$\pm 4^\circ$
	$> 1,0$ to 2,0	$\pm 2^\circ$
	$> 2,0$ to 10,0	$\pm 1,5^\circ$
	$> 10,0$	$\pm 1^\circ$

4.3 Construction

4.3.1 General

The following requirements shall apply to all mounts and mounted lenses.

4.3.2 Dimensions

Trial case lenses shall have a circular mount, the rounded edges of which shall have a maximum radius of 1,4 mm.

The outer diameter of the mounted lens shall be either $38_{-0,2}^0$ mm or $28_{-0,2}^0$ mm (for small frames).

NOTE 1 For full- and reduced-aperture mounts in current use, the outer diameters of both mount types are equal.

The maximum thickness of the trial case lens including the mount shall not exceed 2,8 mm.

NOTE 2 Trial case lenses are intended to fit into a trial frame with a lens separation of 3 mm as specified in ISO 12867.

Full-aperture lenses with power in excess of $\pm 5,00$ D may exceed this thickness limit.

Full-aperture prismatic lenses and reduced-aperture prismatic lenses with power in excess of $3,0 \Delta$ may exceed this thickness limit on the side nearer the object.

4.3.3 Free lens aperture

For trial case lenses with a nominal lens power of not more than $12,00$ D, the diameter of the free lens aperture shall be not less than 18 mm.

For trial case lenses with a nominal lens power greater than $12,00$ D, the diameter of the free lens aperture shall be not less than 16 mm.

NOTE An aperture diameter of 16 mm is acceptable for most purposes. A larger diameter is sometimes preferred.

4.3.4 Prismatic lenses

Prismatic lenses shall be mounted so that the surface nearer the eye is parallel to the plane of the mount.

The prismatic power marked on the mount shall be the power for light incident normal to the surface nearer the eye.

NOTE This value corresponds to the result measured with a focimeter.

4.3.5 Mount

The mount shall contain no surfaces, sharp edges or corners which could cause injury to the patient or practitioner under normal conditions of use.

Marks shall be applied to the mount as described in Clause 6.

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4.4 Material and surface quality

4.4.1 The lens shall have no blisters, blurs, scratches or other defects, nor any irregularities of the surface which can be recognized with the unaided (naked) eye.

These requirements shall be met over the full free lens aperture.

4.4.2 Materials used in the construction shall be of non-corrosive composition or suitably surface-treated to render them non-corrosive in clinical atmospheric conditions.

5 Test methods

5.1 General

All tests described in this International Standard are type tests.

5.2 Checking the optical requirements

Conformity to the requirements specified in 4.2 shall be tested using a device which does not exceed a measuring error of $0,01$ D or 20 % of the given tolerance for vertex power, whichever is greater, and of $0,5^\circ$ for cylinder axis direction and prism base setting.