
**Ophthalmic optics — Visual acuity
testing — Standard and clinical
optotypes and their presentation**

*Optique ophtalmique — Mesure de l'acuité visuelle — Optotype
normalisé et optotypes cliniques et leur présentation*

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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).

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This third edition cancels and replaces the second edition (ISO 8596:2009), which has been technically revised.

The main changes compared to the previous edition are as follows:

- a) restructuring of technical content into the [Clauses 4](#) and [6](#) has been applied;
- b) terms and definitions with the terms standard optotype, clinical optotype, visual acuity, and the systems decimal visual acuity, Snellen fraction, LogMAR acuity, and visual acuity grade have been added;
- c) Snellen fraction values in [Table 1](#) have been added;
- d) [Figure 2](#) has been added;
- e) [Annex A](#) has been added.

Ophthalmic optics — Visual acuity testing — Standard and clinical optotypes and their presentation

1 Scope

This document specifies a range of Landolt ring optotypes and describes a method for measuring distance visual acuity under photopic conditions for the purposes of certification or licensing.

This document is neither intended as a standard for clinical measurements nor for the certification of blindness or partial sight.

Other optotypes used for clinical investigations are described in [Annex A](#) for information.

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 3:1973, *Preferred numbers — Series of preferred numbers*

3 Terms and definitions (standards.iteh.ai)

For the purposes of this document, the following terms and definitions apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 standard optotype

Landolt ring

Note 1 to entry: The Landolt ring is specified in [Table 1](#) and [Figure 1](#).

3.2 clinical optotype

optotype other than the *standard optotype* ([3.1](#)) used for measuring *visual acuity* ([3.3](#))

Note 1 to entry: This definition does not exclude the standard optotype from being used for the same purposes as a clinical optotype.

Note 2 to entry: Since clinical optotypes can differ greatly in legibility, it is crucial to refer to the standard optotype whenever the comparability of the results is important. ISO/TR 19498 provides a method for correlation of clinical optotypes to the standard optotype.

3.3 visual acuity

number characterizing the ability of the visual system to recognize optotypes

Note 1 to entry: Currently, three different scaling systems are used to describe the visual acuity of a patient. These are decimal visual acuity, Snellen fraction, LogMAR acuity. See [Table 1](#).

3.3.1

decimal visual acuity

reciprocal of the minimum recognizable gap width of a Landolt ring measured in minutes of arc

EXAMPLE A visual acuity of 1,0 is assigned when the smallest Landolt ring recognized by a patient has a gap width of 1 min of arc measured from the patient's viewing distance.

3.3.2

Snellen fraction

notation for specifying the angular subtense of an optotype, expressed as a fraction with the numerator (test distance) being the distance at which *visual acuity* (3.3) is tested, commonly in m or ft, and the denominator (normal distance) being the distance at which the critical detail (limb) of the smallest recognizable optotype subtends 1 min of arc

$$V_{Sn} = \frac{D_t}{D_n}$$

where

V_{Sn} is the visual acuity, measured as Snellen fraction;

D_t is the test distance, measured in m or ft;

D_n is the normal distance, measured in m or ft.

EXAMPLE A Snellen fraction of 6/6 is assigned to the visual resolving power of a patient, when the smallest recognizable Landolt ring has a gap size of 1 min of arc from a viewing distance of 6,0 m.

Note 1 to entry: The decimal visual acuity can be calculated from the Snellen fraction by evaluating the above quotient (e.g. Snellen fraction 6/6 = decimal visual acuity 1,0).

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3.3.3

LogMAR acuity

logarithm (base 10) of the minimum angle of resolution measured in minutes of arc

Note 1 to entry: LogMAR acuity can be converted to *decimal visual acuity* (3.3.1) by:

$$\text{Decimal visual acuity} = 10^{(-\text{LogMAR acuity})}$$

3.4

visual acuity grade

number assigned to an optotype that is equal to the minimum visual acuity of a patient necessary to recognize the optotype from a specified distance

Note 1 to entry: The standardized visual acuity grades used in the three different scaling systems are given in [Table 1](#).

4 Requirements

4.1 Specifications of the standard optotype

The Landolt ring is detailed in [Table 1](#) and shown in [Figure 1](#).

The decimal visual acuity grade 1 shall be represented by a Landolt ring whose outer diameter, d , subtends an angle of 5 min of arc and whose width, as well as the gap in its continuity, subtends an angle of 1 min of arc at the designated viewing distance.

The Landolt ring shall be capable of being presented with eight different gap orientations, including left and right horizontal orientations, upper and lower vertical orientations, and the four principal diagonal orientations.

4.2 Visual acuity grades and standard optotype grades

The visual acuity grades shall be as given in Table 1. The gap size of the standard optotype shall be graduated logarithmically. The quotient of the size of the optotype and that of the next smaller one shall be

$$\sqrt[10]{10} = 1,2589 \text{ (series of preferred numbers R10 from ISO 3:1973)}$$

Optotypes of decimal acuity grades 0,05, 0,06, 0,08 and 2,0 may be omitted if necessary. Use of additional decimal acuity grades, either larger or smaller than those listed in Table 1, is permitted.

Table 1 — Visual acuity grades, Landolt ring sizes and minimum number of presentations

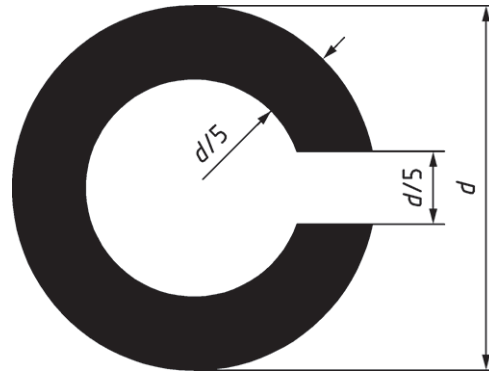
Visual acuity grades (nominal values) ^d			Gap size of Landolt ring (minutes of arc)	Minimum number of presentations ^d
Decimal visual acuity ^a	LogMAR acuity	Snellen fraction for test distance 6 m		
0,05	+1,30	6/120	20,0 ^b	2
0,063 (0,06)	+1,20	6/95	15,8 ^b	2
0,08	+1,10	6/75	12,6 ^b	2
0,10	+1,00	6/60	10,0 ^b	2
0,125	+0,90	6/48	7,94 ^b	3
0,16	+0,80	6/38	6,31 ^b	3
0,20	+0,70	6/30	5,01 ^b	3
0,25	+0,60	6/24	3,98 ^b	5
0,32 (0,30)	+0,50	6/19	3,16 ^b	5
0,40	+0,40	6/15	2,51 ^b	5
0,50	+0,30	6/12	2,00 ^b	5
0,63 (0,60)	+0,20	6/9,5	1,58 ^b	5
0,80	+0,10	6/7,5	1,26 ^b	5
1,00	0	6/6,0	1,00 ^b	5
1,25	-0,10	6/4,8	0,794 ^b	5
1,60	-0,20	6/3,8	0,631 ^b	5
2,00	-0,30	6/3,0	0,501 ^c	5

^a The values in parentheses shall be used only for the purpose of identifying the acuity grade.

^b The gap size is accurate to 1 %. The permissible deviation is 5 %.

^c The permissible deviation is 10 %.

^d The recommended number of presentations is at least 5 presentations.



Key
 d diameter

Figure 1 — Landolt ring

Table 2 — Spacing between standard optotypes (border to border)

Decimal visual acuity grades	Minimum spacing between standard optotypes
less than 0,06	0,4 × diameter of Landolt ring
0,06 to 0,125	1,0 × diameter of Landolt ring
0,16 to 0,32	1,5 × diameter of Landolt ring
0,40 to 1,00	2 × diameter of Landolt ring
greater than 1,00	3 × diameter of Landolt ring

4.3 Test area and spacing between standard optotypes

The field shall extend at least 0,5° in all directions from the contour of the optotypes to the border of the test field. If more than one standard optotype is used in the same test area, the spacings given in [Table 2](#) shall apply. If more than one acuity grade is used on the test area, the spacing for the largest optotype shall apply.

[Table 2](#) applies to both horizontal and vertical spacing.

The background to the optotypes shall appear uniformly bright and without any variation of colour or texture which could indicate the orientation of the symbols. If the different orientations are achieved by rotation of the optotypes, this rotary movement shall not be observed by the subject.

4.4 Positions of the optotype

The optotype shall be presented in at least the number of different positions per acuity grade as shown in [Table 1](#). In 50 % of these positions, the gap shall be either vertical or horizontal but, in the case when an odd number of presentations is used, this value shall be rounded to the next larger integer. The sequence of presentations shall be as diversified as possible and shall be randomly ordered. If the standard optotype is presented singly, this fact shall be specifically mentioned in the test report.

4.5 Quality of presentation

The standard optotype as presented shall appear with sharply defined contours to an observer with a binocular visual acuity of at least 1,0 at an observation distance of 1/3 of the distance at which the optotypes are designed to be used.

The optotypes in a series shall not differ noticeably in contrast and contour.

Test types presented in instruments shall be observed with a magnification of 3× in order to verify the quality of presentation.

4.6 Luminance

The luminance in the immediate surround of the optotypes (chart background, see L_v in Figure 2) shall be within the range of 80 cd/m² to 320 cd/m², and shall apply to all methods of presentation.

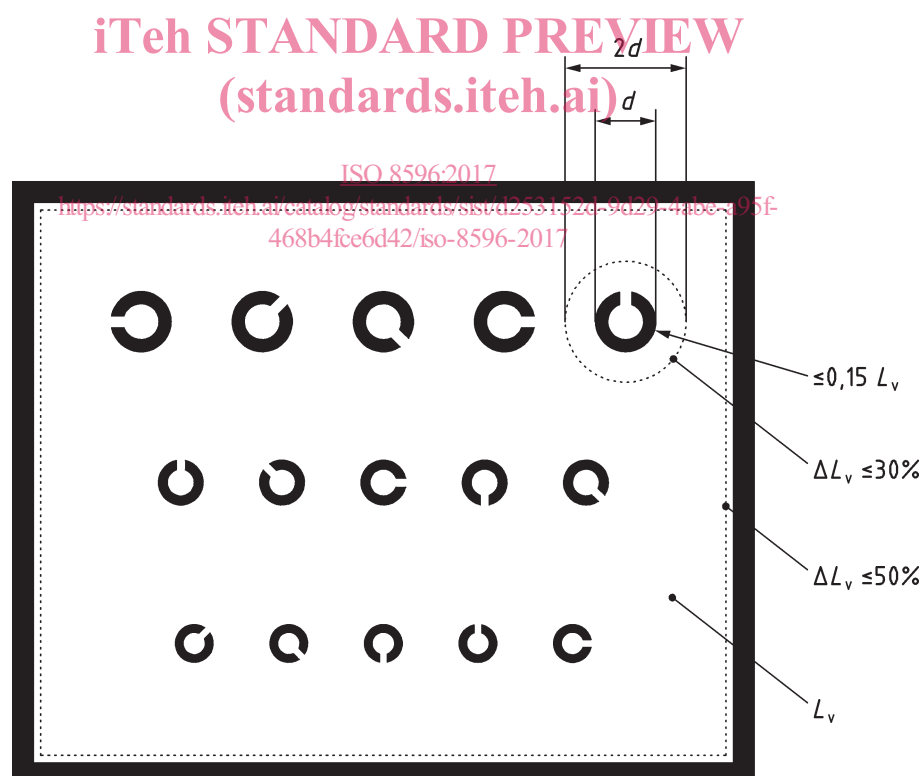
The luminance of the standard optotype shall be not more than 15 % of the surrounding field, when measured in a darkened room. All light sources and reflective surfaces in the visual field of the patient shall be not brighter than the chart from the vantage point of the test subject. In addition, no light source shall illuminate the chart in a way that alters the chart luminance or the optotype contrast from the vantage point of the test subject. There shall be no direct or indirect glare source (e.g. light source, reflected image of a light source, glossy or very bright matt surface) within the field of view.

NOTE 1 The recommended luminance is 200 cd/m².

NOTE 2 The luminance requirements of the optotypes and chart background are shown in Figure 2.

The luminance of the chart background extending for 0,5 d (where d = optotype diameter) beyond the optotype edge should not vary by more than ±30 % of the mean luminance of the background. The luminance meter should measure an area of diameter not greater than 0,05 d .

Across the entire area of the chart background, the luminance should not vary by more than ±50 %. See Figure 2.



Key

- d diameter of the Landolt ring
- L_v luminance of immediate surround of the optotypes
- ΔL_v variability of luminance in the denoted area

Figure 2 — Specification of luminance