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Visual acuity testing equipment

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Health Labour and Welfare through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by the Japan Medical-optical Equipment Industrial Association (JMOIA)/ the Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS T 7309 : 1988** is replaced with this Standard.

This revision has been made based on **ISO 8596 : 1994** *Ophthalmic optics—Visual acuity testing—Standard optotype and its presentation* and **ISO 8597 : 1994** *Optics and optical instruments—Visual acuity testing—Method of correlating optotypes* for the purposes of making it easier to compare this Standard with International Standards; to prepare Japanese Industrial Standard conforming with International Standards; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Definitions	2
4 Classification	3
5 Environmental conditions	3
6 Optotypes	3
6.1 Optotypes	3
6.2 Dimensions of Landolt ring optotypes	3
6.3 Optotypes other than Landolt ring	3
7 Performance	3
7.1 Standard visual acuity testing equipment	3
7.2 Semi-standard visual acuity testing equipment	5
7.3 Special visual acuity testing equipment	6
8 Construction, function and quality	6
9 Tests	6
9.1 Test regarding safety	6
9.2 Performance test	7
10 Instruction manual	8
11 Marking	8
Annex A (normative) Correlated test method between letters and graph optotypes and Landolt ring	9
Annex B (informative) Long distance visual acuity testing method and test report	12
Annex 1 (informative) Comparison table between JIS and corresponding International Standards	14

Visual acuity testing equipment

Introduction This Japanese Industrial Standard has been made adopting the corresponding International Standard about the optotypes and their performance used for the standard visual acuity testing equipment classified as one of three types of visual acuity testing equipment specified in **JIS T 7309** published in 1988 as the first edition on the basis of **ISO 8596** *Ophthalmic optics—Visual acuity testing—Standard optotype and its presentation* published in 1994 as the first edition, and by modifying the presentation and/or technical contents of the standard. The specification not included in the original International Standard, namely, the specification for semi-standard visual acuity testing equipment and special visual acuity testing equipment and the specification concerning environmental conditions, tests and instruction manual are added to this Japanese Industrial Standard. In addition, by adopting **ISO 8597** *Optics and optical instruments—Visual acuity testing—Method of correlating optotypes* published in 1994 as the first edition and by modifying the presentation and/or technical contents with respect to the correlating testing method between Landolt ring and letter, and graphic optotypes, Annex A (normative) has been prepared.

The list in which the modification and addition to **ISO 8596** and **ISO 8597** are given, together with the explanation, is Annex 1 (informative).

1 Scope This Standard specifies the equipment used for testing visual acuity (hereafter referred to as “visual acuity testing equipment”) and the optotypes for testing visual acuity (hereafter referred to as “optotypes”).

Remarks 1 The chart projectors for testing visual acuity are specified in **JIS T 7310**.

- 2 The correlating test method between letters and graphic optotypes and Landolt rings is specified in Annex A (normative).
- 3 Long distance visual acuity testing method and test report are supplemented in Annex B (informative).
- 4 The International Standard corresponding to this Standard is as follows:

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 8596 : 1994 *Ophthalmic optics—Visual acuity testing—Standard optotype and its presentation* (MOD)

ISO 8597 : 1994 *Optics and optical instruments—Visual acuity testing—Method of correlating optotypes* (MOD)

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards, only the edition of the

indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply. The normative references without the indication of the year of publication apply only to the most recent edition (including amendments).

JIS B 7153 *Measuring microscopes*

JIS B 7184 *Profile projectors*

JIS C 7614 *Methods of luminance measurements in lighting fields*

JIS T 0601-1 *Medical electrical equipment—Part 1 : General requirements for safety*

Remarks : **IEC 60601-1** : 1988 *Medical electrical equipment—Part 1 : General requirements for safety*, **Amendment 1** : 1993 and **Amendment 2** : 1995 are identical with the said standard

JIS Z 8120 *Glossary of optical terms*

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

3 Definitions For the purposes of this Standard the definitions given in **JIS Z 8120** and the following definitions apply.

- a) **standard visual acuity testing equipment:** equipment manufactured for testing long distance visual acuity using the optotypes which consist of an eight-position Landolt ring and placing emphasis on the accuracy of the test.
- b) **semi-standard visual acuity testing equipment:** equipment manufactured for testing long distance visual acuity using the optotype of Landolt rings and, partially, the optotypes of other type and placing emphasis on practical use, including those of reflecting use by mirror.
- c) **special visual acuity testing equipment:** equipment not included in the standard visual acuity testing equipment and semi-standard visual acuity testing equipment, namely, short distance visual acuity testing equipment, individual letter visual acuity testing equipment, visual acuity testing equipment for screening, visual acuity testing equipment for both eyes opened testing, optical visual acuity testing equipment, etc.
- d) **short distance visual acuity test equipment:** equipment for testing the visual acuity over a short distance mainly for the purpose of short distance work and, clinically, mainly for the purpose of the prescription for farsighted glasses.
- e) **individual letter visual acuity testing equipment:** visual acuity testing equipment which presents the optotype one by one.
- f) **visual acuity testing equipment for screening:** visual acuity testing equipment for group medical examinations from a screening test at the primary stage to precise examination.
- g) **visual acuity testing equipment for both eyes opened testing:** visual acuity testing equipment capable of testing the visual acuity of right and left eyes individually and both eyes simultaneously where both eyes are opened.
- h) **optical visual acuity testing equipment:** visual acuity testing equipment of such construction that the optotypes are indicated by an optical system.

- i) **viewing distance:** a distance between the entrance pupil of the subject and the optotype.

4 Classification The visual acuity testing equipment shall be classified into the following three types:

- a) Standard visual acuity testing equipment
- b) Semi-standard visual acuity testing equipment
- c) Special visual acuity testing equipment

5 Environmental conditions As specified in JIS T 0601-1.

6 Optotypes

6.1 Optotypes For the optotypes, the Landolt ring shown in Fig. 1, optotypes of a letter such as letter E, KATAKANA, HIRAGANA, numeral, other alphabet, letters, etc. and graphic optotypes such as shadow pictures, line drawings, etc. shall be used. Out of all of these, the Landolt ring is used as the standard optotype.

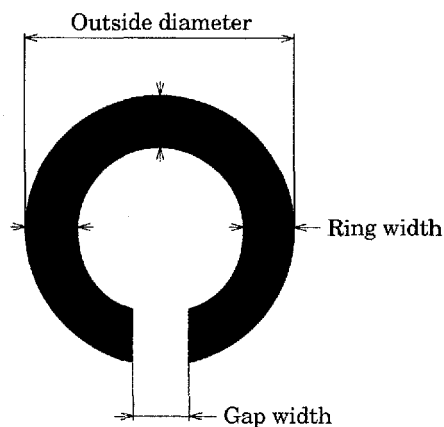


Fig. 1 Landolt ring

6.2 Dimensions of Landolt ring optotypes The dimensions of the Landolt ring is that, for the visual acuity 1.0, the visual angle is 5' in external form and 1' in ring width and gap width and for the visual acuity a , $1/a$ of the optotypes for the visual acuity 1.0.

6.3 Optotypes other than Landolt ring The optotypes other than the Landolt ring are correlated clinic-experimentally with the Landolt ring so as to be the optotypes whose drawing method and standard value of dimensions are classified. The correlated testing method between the Landolt ring and other letter and graphic optotypes should preferably be in accordance with Annex A (normative).

7 Performance

7.1 Standard visual acuity testing equipment The performance of the standard visual acuity testing equipment shall be as follows:

7.1.1 Optotypes to be used Eight-position Landolt ring is used.

7.1.2 Visual acuity and visual acuity grade The visual acuity is expressed with the reciprocal of the visual angle (unit in minute) of the gap width and the grade of visual acuity is as given in Table 1.

- a) The optotypes are in an arrangement of arithmetical series in the logarithmic expression and in an arrangement of geometric series in the visual angle. The quotient of the visual angle of a test type divided by the next smaller one is the series of preferred numbers R10 from ISO 3.

$$\sqrt[10]{10} = 1.2589$$

- b) Optotypes of acuity grades 0.05, 0.063, 0.08, 2.0 may be omitted if necessary. Addition of further acuity grades is permitted.

Table 1 Visual acuity grades

Acuity grade	Log gap size	Optotype size: gap width and ring width		Minimum number of optotypes at the same grade
		Visual angle (')	Permissible deviation %	
0.05	+1.3	20	±5	2
0.063 (0.06) ⁽²⁾	+1.2	16		
0.08	+1.1	12.5		
0.1	+1.0	10		
0.125	+0.9	8		3
0.16	+0.8	6.3		
0.2	+0.7	5		
0.25	+0.6	4		5
0.32 (0.3) ⁽²⁾	+0.5	3.2		
0.4	+0.4	2.5		
0.5	+0.3	2		
0.63 (0.6) ⁽²⁾	+0.2	1.6		
{0.7} ⁽¹⁾	{+0.15} ⁽¹⁾	{1.4} ⁽¹⁾		
0.8	+0.1	1.25		
1.0	0.0	1		
1.25	-0.1	0.8		
1.6	-0.2	0.63		
2.0	-0.3	0.5	±10	

Notes (1) {0.7} in Table 1 which is not in accordance with the arrangement of optotypes shows that the addition of the visual acuity 0.7 is preferable from the view point of domestic law.

- (2) The numerical values given in () in the Table 1 are used only for identifying the visual acuity grade.

7.1.3 Accuracy of optotypes The accuracy of optotypes is ±5 % of the standard value up to the visual acuity 1.6 and ±10 % of the standard value at the visual acuity 2.0, when tested in accordance with the method specified in 9.2.1.

7.1.4 Minimum number of optotypes at the same grade As given in Table 1.

7.1.5 Test area The field extends at least 0.5° in all directions from the contour of the optotypes to the border of the test field.

7.1.6 Spacing between optotypes If more than one acuity grade is used on the test area, the spacing is as given in Table 2.

Table 2 Spacing between standard optotypes (border to border)

Acuity grade	Minimum spacing between standard optotypes
0.05 or less	Twice the gap width of Landolt
0.06 to 0.125	Diameter of Landolt ring
0.16 to 0.32	1.5 times the diameter of Landolt ring
0.4 to 1.0	Twice the diameter Landolt ring
Greater than 1.0	3 times the diameter of Landolt ring

Remarks : Table 2 applies to both horizontal and vertical spacing.

7.1.7 Luminance The luminance conforms, when tested in accordance with the method specified in 9.2.2, to the following requirements:

- The luminance in the test area is 80 cd/m^2 to 320 cd/m^2 (recommended luminance is 200 cd/m^2).
- The luminance of the optotypes (black base) does not exceed 15 % of the luminance of the test field (white base).
- White light within a color temperature range of 2 500 K to 7 000 K is not allowed to be used.

7.1.8 Contrast The contrast is, when tested in accordance with the method specified in 9.2.3, 74 % or more.

7.2 Semi-standard visual acuity testing equipment The performance of the semi-standard visual acuity testing equipment shall be as follows:

7.2.1 Optotypes to be used Landolt rings and the optotypes correlated with the Landolt ring shall be used.

7.2.2 Visual acuity grade No specific grade is given but the visual acuity at each grade shall be clearly shown.

7.2.3 Accuracy of optotypes $\pm 10 \%$ of the standard value when tested in accordance with the method specified in 9.2.1.

7.2.4 Minimum number of optotypes at the same grade The number specified in the standard visual acuity testing equipment applies.