INTERNATIONAL STANDARD

ISO 11884-1

Second edition
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Optics and photonics — Minimum requirements for stereomicroscopes —

Part 1: Stereomicroscopes for general use

Optique et photonique — Exigences minimales pour les stéréomicroscopes —

Partie 1: Stéréomicroscopes à usage général

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Foreword

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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 11884-1 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 5, *Microscopes and endoscopes*.

This second edition cancels and replaces the first edition (ISO 11884-1:1998), which has been technically revised.

ISO 11884 consists of the following parts, under the general title *Optics and photonics — Minimum requirements for stereomicroscopes*:

— *Part 1: Stereomicroscopes for general use*

— *Part 2: High performance microscopes*

Optics and photonics — Minimum requirements for stereomicroscopes —

Part 1: Stereomicroscopes for general use

1 Scope

This part of ISO 11884 specifies minimum requirements for stereomicroscopes used mainly for visual observation for general use.

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 9022-1, *Optics and optical instruments — Environmental test methods — Part 1: Definitions, extent of testing*

ISO 9022-2, *Optics and optical instruments — Environmental test methods — Part 2: Cold, heat and humidity*

ISO 9022-3, *Optics and optical instruments — Environmental test methods — Part 3: Mechanical stress*

ISO 10934-1, *Optics and optical instruments — Vocabulary for microscopy — Part 1: Light microscopy*

ISO 11883, *Optics and optical instruments — Microscopes — Marking of stereomicroscopes*

ISO 15227, *Optics and optical instruments — Microscopes — Testing of stereomicroscopes*

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements*

CIE 10526, *CIE Standard Illuminants for Colorimetry*

3 Terms and definitions

For the purposes of this part of ISO 11884, the terms and definitions given in ISO 10934-1 apply.

4 Requirements

The following are minimum requirements.

4.1 Optical and mechanical specifications

The specifications given in Table 1 shall apply.

Testing shall be done in accordance with 5.1.

Table 1 — Requirements for optical and mechanical specifications

Criterion			Requirements
Tolerance of total magnification			± 10 %
Difference in magnification between left and right optical systems			⩽ 2 %
Difference in axis between left and right optical systems [a]	vertical		⩽ 20'
	horizontal [b]	convergence	⩽ 45'
		divergence	⩽ 10'
Horizontal difference in the centre of the primary image between left and right optical systems [c]			⩽ 0,33 mm
Difference in the centre of the eyepiece diaphragm between left and right optical systems [d]	vertical		⩽ 0,2 mm
	horizontal [e]	divergence	⩽ 0,4 mm
		convergence	⩽ 0,4 mm
Lateral shift of focusing plane by magnification change			0,4 mm diameter [f]
Focus difference between left and right optical systems			⩽ 1,5 D_F [g]
Difference in imaging rotation between left and right image			⩽ 3°
Minimum range for interpupillary distance			55 mm to 75 mm
Difference in exit pupil height between left and right optical system at the equal dioptre adjustments			⩽ 1,5 mm
Resolution in the centre of the field			⩾ 2 000 NA line pairs/mm [h]

[a] To be measured with a 10 × eyepiece adjusted at 0 D.

[b] This requirement applies to those stereomicroscopes where the mechanical axes of the eyepieces are parallel to each other due to the design.

[c] This requirement is only valid when the horizontal difference in axis does not apply.

[d] To be measured on the primary image plane of the stereomicroscope to be tested.

[e] This requirement applies to those stereomicroscopes where the mechanical axes of the eyepieces are not parallel due to the design.

[f] The displacement of a centred structure shall be inside a centred circle of 0,4 mm diameter in the primary image plane.

[g] Depth of field (in object space) D_F, expressed in millimetres, is given by:

$$D_F = \frac{\lambda}{2 \times (NA)^2} + \frac{1}{7 \times M_{TOT\ VIS} \times (NA)}$$

where

λ is the wavelength in millimetres;

NA is the numerical aperture;

$M_{TOT\ VIS}$ is the total visual magnification.

[h] To be measured with the standard illuminant A in accordance with CIE 10526.

4.2 Environmental conditions

Testing shall be done in accordance with 5.2.

4.2.1 Conditions of use

The functioning of stereomicroscopes given in the relevant instrument specifications, shall be ensured under the environmental conditions given in Table 2. Under these conditions all optical and mechanical requirements apply, if necessary with the inclusion of correction tables.

Table 2 — Conditions of use

Criterion	Environmental condition
Temperature	10 °C to 40 °C
Relative humidity	$\leqslant$ 85 %
Atmospheric pressure	700 hPa to 1 060 hPa
Shock	10 g for the duration of 6 ms

4.2.2 Storage conditions

After being exposed to the conditions given in Table 3, stereomicroscopes shall meet the instrument specifications under conditions of use as specified in 4.2.1.

Table 3 — Storage conditions

Criterion	Environmental condition
Temperature	−10 °C to 55 °C
Relative humidity	$\leqslant$ 95 %
Atmospheric pressure	700 hPa to 1 060 hPa

4.2.3 Transport conditions

The transport clause is recommended for all packing requirements, but the following conditions shall apply when compliance to the transport clause of this part of ISO 11884 is claimed by the manufacturer.

After exposure of the stereomicroscopes in their original packing to the conditions given in Table 4, the stereomicroscopes shall meet the instrument specifications under conditions of use as specified in 4.2.1.

Table 4 — Transport conditions

Criterion	Environmental condition
Temperature	−40 °C to 70 °C
Relative humidity	$\leqslant$ 100 %
Atmospheric pressure	500 hPa to 1 060 hPa
Vibration, sinusoidal	10 Hz to 500 Hz; 0,5 g
Shock	30 g for the duration of 6 ms
Bump	10 g for the duration of 6 ms

4.3 Safety

Testing shall be done in accordance with 5.3.

IEC 61010-1 shall apply.

5 Test methods

All tests specified in this part of ISO 11884 are type tests.

5.1 Testing of optical and mechanical specifications

The requirements of 4.1 are tested in accordance with the test methods of ISO 15227.

Measurements shall be carried out according to general rules of statistical evaluation.

5.2 Testing of the environmental conditions

The requirements of 4.2 shall be tested in accordance with the test methods of the relevant part of ISO 9022 given in Table 5.

5.3 Testing of the safety

Tests in accordance with IEC 61010-1 apply.

6 Accompanying documents

The stereomicroscope shall be accompanied by documents containing instructions for use, cleaning and maintenance.

7 Marking

Marking shall be done in accordance with ISO 11883.

Table 5 — Environmental tests

Conditions	Test [a]	In accordance with	Remarks
Environmental conditions of use	ISO 9022-11-01-2 (10 ± 2) °C / 16 h	ISO 9022-2	dry heat
	ISO 9022-11-02-2 (40 ± 2) °C / 16 h		
	ISO 9022-12-01-2 (40 ± 2) °C / 90 % to 95 % RH / 16 h		damp heat
Storage conditions	ISO 9022-10-02-1 (–10 ± 3) °C / 16 h	ISO 9022-2	cold
	ISO 9022-11-03-1 (55 ± 2) °C / 16 h		dry heat
	ISO 9022-12-01-1 (40 ± 2) °C / 90 % to 95 % RH / 16 h		damp heat
Transport conditions	ISO 9022-10-08-0 (–40 ± 3) °C / 16 h	ISO 9022-2	cold
	ISO 9022-11-05-0 (70 ± 2) °C / 6 h		dry heat
	ISO 9022-16-01-0 (23 ± 2) °C / 80 % to 85 % RH / 5 cycles (40 ± 2) °C / 90 % to 95 % RH / 5 cycles		damp heat, cyclic
	ISO 9022-30-03-0 30 *g* / 6 ms	ISO 9022-3	shock
	ISO 9022-31-01-0 10 *g* / 6 ms / 1 000 shocks		bump
	ISO 9022-36-02-0 1 *g* / 10 Hz to 2 000 Hz / 2 cycles		sinusoidal vibration

[a] The environmental test code reads as follows: ISO 9022-xx-yy-z

ISO 9022 environmental International Standard

xx: conditioning method _____

yy: degree of severity _____

z: state of operation of the instrument _____

The figures “xx” in the conditioning methods listed above have the following meaning:

10: cold

11: dry heat

12: damp heat

13: condensed water

14: slow temperature change

16: damp heat, cyclic

30: mechanical stress - shock

31: mechanical stress - bump

36: mechanical stress - sinusoidal vibration.

Severity grades “yy” are given in the relevant part of ISO 9022.

The figure “z” of the state of operation means:

0: specimen in its normal transport and/or storage container as provided by the manufacturer.

1: specimen unprotected, ready for operation, power supply not connected.

2: specimen in operation during the test as specified in the relevant specification.

ICS 37.020

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