INTERNATIONAL STANDARD

ISO 11884-2

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Optics and optical instruments — Minimum requirements for stereomicroscopes —

Part 2:
High performance microscopes

Optique et instruments d'optique — Prescriptions minimales pour les stéréomicroscopes —

Partie 2: Microscopes à haute performance

Reference number
ISO 11884-2:1997(E)

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.

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.

International Standard ISO 11884-2 was prepared by Technical Committee ISO/TC 172, *Optics and optical instruments*, Subcommittee SC 5, *Microscopes and endoscopes*.

ISO 11884 consists of the following parts under the general title: *Optics and optical instruments - Minimum requirements for stereomicroscopes*:

Part 1: Stereomicroscopes for general use

Part 2: High performance microscopes

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Optics and optical instruments — Minimum requirements for stereomicroscopes —

Part 2: High performance microscopes

1 Scope

This part of ISO 11884 specifies minimum requirements for high performance stereo-microscopes. It is not applicable to operation microscopes.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11884. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11884 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7944: —[1], *Optics and optical instruments — Reference wavelengths*

ISO 9022-2:1994, *Optics and optical instruments — Environmental test methods — Part 2: Cold, heat, humidity*

ISO 9022-3:1994, *Optics and optical instruments — Environmental test methods — Part 3: Mechanical stress*

ISO 11883:1997 *Optics and optical instruments — Microscopes — Marking of stereomicroscopes*

ISO 10934: —,[2] *Optics and optical instruments — Microscopy — Terms and definitions*

ISO 15227: —,[2] *Optics and optical instruments — Microscopes — Testing of stereomicroscopes*

IEC 1010-1:1990, *Safety requirements for electrical equipment for measurement, control and laboratory use — Part 1: General requirements*

3 Definitions

For the purposes of this part of ISO 11884, the definitions given in ISO 10934 apply.

[1] To be published. (Revision of ISO 7944:1984)

4 Requirements

All indications given below are minimum requirements. They apply to the reference wavelength according to ISO 7944.

4.1 Optical and mechanical specifications

The specifications given in table 1 shall apply.

With regard to the testing, see 5.1.

4.2 Environmental conditions

With regard to the testing, see 5.2.

4.2.1 Conditions of use

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

Table 1 — Requirements for optical and mechanical specifications

Criterion			Requirements
Tolerance of total magnification			± 7,5 %
Difference in magnification between left and right optical systems			≤ 1,5 %
Difference in axes between left and right optical systems[2)]	Vertical		≤ 15'
	Horizontal[1)]	Convergence	≤ 45'
		Divergence	≤ 10'
Horizontal difference in the centres of the primary image between left and right optical systems[3)]			≤ 0,33 mm
Difference in centres of eyepiece diaphragm between left and right optical systems	Vertical		≤ 0,2 mm [4)]
	Horizontal	Divergence	≤ 0,4 mm [4) 5)]
		Convergence	≤ 0,4 mm [4)]
Shift of focussing planes by magnification change		Axial object plane	$S_O \leq 3 \cdot D_F$ [6) 7)]
		Lateral image plane [8)]	≤ 0,4 mm diameter
Focus difference between both optical systems			$D_{L/R} < 1{,}5 \cdot D_F$ [6)]
For highest magnification the resolution in the centre of the field should be a minimum of			1800 · NA line pairs/mm
Difference in imaging rotation between right and left images			≤ 2°
Eyepiece	Difference in exit pupil height between left and right optical systems		≤1,5 mm at 0 D on the dioptre scale
	Calibration error if a dioptre scale is used		± 0,25 D at 0 D on the dioptre scale
	Minimum range for interpupillary distance		55 mm to 75 mm
	Minimum adjustment range		+5 D to – 5 D

1) This requirement does not apply to those stereomicroscopes where the mechanical axes of the eyepieces are not parallel to each other due to the design.
2) Including a 10 x eyepiece and 0 D adjustment.
3) This requirement is only valid if the horizontal difference in axes does not apply.
4) To be measured on the image plane of the stereomicroscope to be tested.
5) This requirement applies to those stereomicroscopes where the mechanical axes of the eyepieces are not parallel due to the design.
6) Depth of field D_F (in object space)

$$D_F = \frac{\lambda}{2NA^2} + \frac{1}{7 M_{TOTVIS} \cdot NA} \text{ [mm]}$$

where:

λ is the wavelength, [mm]
NA is the numerical aperture
M_{TOTVIS} is the total visual magnification.

7) S_o is the shift of object plane.
8) The displacement of a centred structure shall be inside a centred circle of 0,4 mm diameter in the primary image plane.

Table 2 — Conditions of use

Criterion	Environmental condition
Temperature	+10 °C to +40 °C
Relative humidity	≤ 85 %
Atmospheric pressure	700 hPa to 1060 hPa
Shock	10 *g*, duration 6 ms

4.2.2 Storage conditions

After being exposed to the conditions given in table 3, stereomicroscopes shall meet the instrument specification under conditions of use according to 4.2.1.

Table 3 — Storage conditions

Criterion	Environmental conditions
Temperature	-10 °C to +55 °C
Relative humidity	≤ 95 %
Atmospheric pressure	700 hPa to 1060 hPa

4.2.3 Transport conditions

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

After exposure of the instruments in their original packing to the conditions given in table 4, stereomicroscopes shall meet instrument specifications under conditions of use according to 4.2.1.

Table 4 — Transport conditions

Criterion	Environmental conditions
Temperature	-40 °C to +70 °C
Relative humidity	≤ 100 %
Atmospheric pressure	500 hPa to 1060 hPa
Sinusoidal vibration	10 Hz to 500 Hz: 0,5 *g*
Shock	30 *g*, duration 6 ms
Bump	10 *g*, duration 6 ms

4.3 Safety

With regard to the testing, see 5.3.

IEC 1010-1 shall apply.

5 Test methods

All tests specified in this part of ISO 11884 are type tests. Compliance with the requirements according to 4.1 shall be tested in accordance with ISO 15227.

5.1 Checking of optical and mechanical specifications

Compliance with the requirements of 4.1 are checked with measuring devices whose measuring error shall be smaller than 10 % of the value to be determined.

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

5.2 Checking of environmental conditions

Compliance with the requirements of 4.2 shall be checked in accordance with the appropriate part of ISO 9022 given in table 5.

5.3 Checking of safety

Tests according to IEC 1010-1 shall apply.

6 Accompanying documents

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

7 Marking

Marking shall be in accordance with ISO 11883.

Table 5 — Environmental tests

Conditions	Test code	Reference ISO 9022 — Part	Remarks
Environmental conditions of use	**ISO 9022-11-01-2** (10 ± 2) °C / 16 h	2	Dry heat
	ISO 9022-11-01-2 (40 ± 2) °C / 16 h		
	ISO 9022-12-01-2 (40 ± 2) °C / 90 % to 95 % RH /24 h		Damp heat
Storage conditions	**ISO 9022-10-01-1** (-10 ± 3) °C / 16 h	2	Cold
	ISO 9022-11-02-1 (+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 9022-10-05-0** (-40 ± 3) °C / 16 h	2	Cold
	ISO 9022-11-04-0 (+70 ± 2) °C /16 h		Dry heat
	ISO 9022-16-01-0 +23 °C / 80 % to 85 % RH / +40 °C / 90 % to 95 % RH /5x		Damp heat, cyclic
	ISO 9022-30-03-0 30 *g* / 6 ms	3	Shock
	ISO 9022-31-01-0 Bump 10 *g* / 6 ms / 1000x		Bump
	ISO 9022-36-02-0 1 *g* / 10 Hz to 2000 Hz / 2x		Sinusoidal vibration

NOTE 1 - The environmental test code designation reads as follows:

ISO 9022 — xx — xx — x

- Environmental ISO Standard
- Conditioning method
- Degree of severity
- State of operation of the instrument

NOTE 2 - The numbers used in the test code to represent conditioning methods 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

NOTE 3 - The numbers used in the test code to represent degree of severity are explained in the relevant part of ISO 9022.

NOTE 4 - The numbers used in the test code to represent the state of operation of the instrument have the following meaning:

0: Instrument in its normal transport and/or storage container as provided by the manufacturer.
1: Instrument unprotected, ready for operation, power supply not connected.
2: Instrument in operation during the test as specified in the relevant specification.

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