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**Optics and optical instruments — Minimum requirements for stereomicroscopes —**

**Part 1:**

**Stereomicroscopes for general use**

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

*Partie 1: Stéréomicroscopes à usage général*

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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 3.

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 11884-1 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 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 normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 11884. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 11884 are encouraged to investigate the possibility of applying the most recent edition of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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, humidity*

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

ISO 10934<sup>1)</sup>, *Optics and optical instruments — Microscopy — Terms and definitions (all parts)*

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

ISO 15227<sup>1)</sup>, *Optics and optical instruments — Microscopes — Testing of stereomicroscopes*

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

CIE 10526, *Colorimetric illuminants*

### 3 Terms and definitions

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

1) To be published.

## 4 Requirements

The following are minimum requirements.

### 4.1 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 <sup>1)</sup>	Vertical	≤ 15'	
	Horizontal <sup>2)</sup>	Convergence	≤ 45'
		Divergence	≤ 10'
Horizontal difference in the centre of the primary image between left and right optical systems <sup>3)</sup>		≤ 0,33 mm	
Difference in the centre of the eyepiece diaphragm between left and right optical systems <sup>4)</sup>	Vertical	≤ 0,2 mm	
	Horizontal	Divergence <sup>5)</sup>	≤ 0,4 mm
		Convergence	≤ 0,4 mm
Lateral shift of focusing plane by magnification change		0,4 mm diameter <sup>6)</sup>	
Focus difference between left and right optical systems		≤ 1,5 D <sub>F</sub> <sup>7)</sup>	
Difference in imaging rotation between left and right images		≤ 2°	
Minimum range for interpupillary distance		55 mm to 75 mm	
Difference in exit pupil height between left and right optical systems at equal dioptré adjustments		≤ 1,5 mm	
Resolution in the centre of the field at maximum magnification		≥ 1200 NA line pairs/mm <sup>8)</sup>	
<p>1) To be measured with a 10× eyepiece adjusted at 0 D.</p> <p>2) This requirement applies to those stereomicroscopes where the mechanical axes of the eyepieces are not parallel to each other due to the design.</p> <p>3) This requirement is only valid when the horizontal difference in axis does not apply.</p> <p>4) To be measured on the primary image plane of the stereomicroscope to be tested.</p> <p>5) This requirement applies to those stereomicroscopes where the mechanical axes of the eyepieces are not parallel due to the design.</p> <p>6) The displacement of a centred structure shall be inside a centred circle of 0,4 mm diameter in the primary image plane.</p> <p>7) Depth of field (in object space) <math>D_F</math> is given by:</p> $D_F = \frac{\lambda}{2 \cdot NA^2} + \frac{1}{7 \cdot M_{TOT\ VIS} \cdot NA} \quad ; \text{ [mm]}$ <p>where:</p> <ul style="list-style-type: none"> <li><math>\lambda</math> is the wavelength, in millimetres;</li> <li><math>NA</math> is the numerical aperture;</li> <li><math>M_{TOT\ VIS}</math> is the total visual magnification.</li> </ul> <p>8) To be measured with the standard illuminant A according to CIE 10526.</p>			

The specifications given in Table 1 shall apply. For testing requirements see 5.1.

**Table 1 — Requirements for optical and mechanical specifications**

## 4.2 Environmental conditions

For testing requirements see 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	≤ 85 %
Atmospheric pressure	700 hPa to 1060 hPa
Shock	10 g for a duration of 6 ms

### 4.2.2 Storage conditions

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

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**Table 3 — Storage conditions**

Criterion	Environmental condition
Temperature	−10 °C to 55 °C
Relative humidity	≤ 95 %
Atmospheric pressure	700 hPa to 1060 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 original packing to the conditions given in Table 4, the stereomicroscopes shall meet the instrument specifications under conditions of use according to 4.2.1.

Table 4 — Transport conditions

Criterion	Environmental condition
Temperature	−40 °C to 70 °C
Relative humidity	≤ 100 %
Atmospheric pressure	500 hPa to 1060 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

For testing requirements see 5.3.

IEC 61010-1 shall apply.

## 5 Test methods

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

### 5.1 Testing of the 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

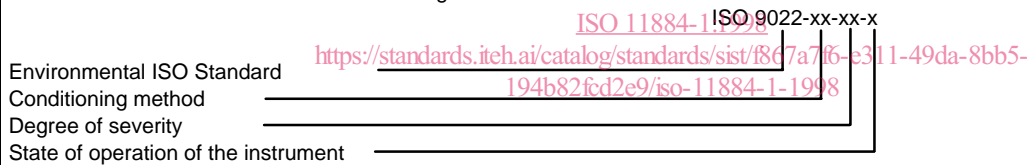
The requirements of 4.2 are tested in accordance with the test method of the appropriate part of ISO 9022 given in table 5.



Table 5 — Environmental tests

Conditions	Test	According to ISO 9022 Part	Remark
Environmental conditions in use	ISO 9022-11-01-2 (10 ± 2) °C / 16 h	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	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	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	3	Shock
	ISO 9022-31-01-0 10 g / 6 ms / 1000 shocks		Bump
	ISO 9022-36-02-0 1 g / 10 Hz to 2000 Hz / 2 cycles		Sinusoidal vibration

NOTE 1 — The environmental test code designation in accordance with ISO 9022-1 reads as follows:



NOTE 2 — The numbers 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

NOTE 3 — Severity grades are given in ISO 9022-1 and ISO 9022-2.

NOTE 4 — The numbers of the state of operation mean:

- 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.