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Optics and optical instruments — Specifications for binoculars, monoculars and spotting scopes —

Part 2:
High performance instruments

Optique et instruments d'optique — Spécifications pour jumelles, monoculaires et lunettes —

Partie 2: Instruments haute performance

ICS 37.020

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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 14133-2 was prepared by Technical Committee ISO/TC 172, *Optics and optical instruments*, Subcommittee SC 4, *Telescopic systems*.

ISO 14133 consists of the following parts, under the general title *Optics and optical instruments — Specifications for binoculars, monoculars and spotting scopes*:

— *Part 1: General purpose instruments*

— *Part 2: High performance instruments*

Optics and optical instruments — Specifications for binoculars, monoculars and spotting scopes —

Part 2:
High performance instruments

1 Scope

This part of ISO 14133 applies to high performance binoculars, monoculars and spotting scopes. General purpose binoculars, monoculars and spotting scopes are specified in part 1 of this International Standard.

2 Normative references

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

ISO 10109-4:2001 *Optics and optical instruments - Environmental requirements - Part 4: Test requirements for telescopic systems*

ISO 14132-1[1] *Optics and optical instruments — Terms and definitions for telescopic systems — Part 1: General terms and alphabetical indices of terms in ISO 14132*

ISO 14132-2[1] *Optics and optical instruments — Terms and definitions for telescopic systems — Part 2: Terms for binoculars, monoculars and spotting scopes*

3 Terms and definitions

For definitions of general terms and letter symbols given in this International standard ISO 14132-1 shall apply. Definitions of particular terms for binoculars monoculars and spotting scopes are given in ISO 14132-2.

4 Specifications

4.1 Tolerances

Acceptable deviations of optical characteristics from values for general purpose binoculars, monoculars and spotting scopes shall be within the limits given in Table 1.

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1 To be published.

Table 1 — Acceptable deviations of optical characteristics

Characteristics	Values of tolerances		
Magnification[a]	± 4%		
Field of view in object space[a,b]	± 3%		
Entrance pupil diameter[c]	± 2%		
Exit pupil diameter	± 6%		
Eye relief [mm]	— 0,5 + 5		
Zero-setting error of dioptre scale [dioptre]	± 0,5		
Image rotation [degrees]	± 1,0		
Disparity of image rotations [minutes of arc]	30		
Relative difference in magnification	1,5%		
Focusing difference of telescopes of binoculars when focused by means of the centre focusing mechanism within the focusing range [dioptre]	0,5		
Non-parallelism of axes of beams emergent from the eyepieces of binoculars [minutes of arc]:	$\Gamma \leq 20\times$	$20\times < \Gamma \leq 30\times$	$\Gamma > 30\times$
♦ dipvergence in the vertical plane	20	Γ	30
♦ divergence in the horizontal plane	60	$3\times\Gamma$	90
♦ convergence in the horizontal plane	20	Γ	30

[a] For zoom instruments relates to the minimum and the maximum values.

[b] For instruments referred to as 'wide angle' the minimum field of view in the image space shall be 60°.

[c] Measured at maximum magnification for zoom systems.

4.2 Minimum requirements to optical characteristics

Values of optical characteristics for high performance instruments shall be better than those given in Table 2.

Table 2 — Minimum requirements of optical characteristics

Characteristics	Value
Limit of resolution[a] [seconds of arc] ♦ exit pupil diameter ≤ 4,5 mm ♦ exit pupil diameter > 4,5 mm	$\varepsilon \leq \left(\frac{240}{D}\right)$ $\varepsilon \leq \left(\frac{60}{\Gamma}\right)$
Dioptre adjustment range of spotting scopes and monoculars (total range) [dioptre]	9 (including the range of -3 to +3)
Limits of interpupillary distance adjustment [mm]	58 to 72
Dioptre compensation between right and left eyes [dioptre]: ♦ when focused by means of centre mechanism ♦ dioptre compensation for right and left eyes	9 (including the range of -3 to +3) ± 3
Dioptre adjustment range for binoculars with individual focusing [dioptre]	± 5
[a] When testing zoom binoculars the exit pupil diameter at highest magnification shall be used.	

4.3 Environmental requirements

Binoculars, monoculars and spotting scopes shall withstand the test conditions prescribed for instruments type 01 or 02 in accordance with ISO 10109-4.

5 Designation, marking and information of the product

5.1 Designation and marking

For identification and operation, binoculars, monoculars and spotting scopes shall have the designation and markings enlisted in Table 3.

Table 3 — Designation and marking

Characteristics	Designation and marking	
	required	recommended
Magnification or range of magnifications[a]	×	
Entrance pupil diameter[a] [mm]	×	
Field of view		×
Name of the manufacturer or registered trade mark or trade name	×	
Product name or identification		×
Country of origin		×
Position for zero dioptre		×
Serial number		×
[a] Basic designation is given by the combination of magnification and diameter of entrance pupil e.g.: 8x42.		

5.2 Information of the product

Product catalogues, user manuals and other technical information brochures for binoculars, monoculars and spotting scopes shall provide complete information at least on technical characteristics enlisted in Table 4.

Table 4 — Information of the product

Characteristics	Designation and marking	
	required	recommended
Magnification or range of magnifications	×	
Entrance pupil diameter [mm]	×	
Name of the manufacturer or registered trade mark or trade name	×	
Product name or identification	×	
Country of origin		×
Field of view in the object space [metre per 1000 metre distance, or degree]	×	
Field of view in the image space [degree]		×
Field of view for eyeglass wearers [metre per 1000 metre distance, or degree]		×
Exit pupil diameter [mm]	×	
Eye relief [mm]	×	
Dioptre adjustment range [dioptre]	×	
Range of interpupillary distance adjustment [mm]	×	
Close distance [m]		×
Resolution or MTF		×
Light transmission		×
Type of coating		×
Twilight number		×
Mechanical dimensions [mm]	×	
Mass [g]	×	
Operational temperature range		×
Storage temperature range		×
Water tightness	×	