INTERNATIONAL STANDARD

ISO 14133-2

Second edition
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Optics and photonics — Specifications for binoculars, monoculars and spotting scopes —

Part 2: High performance instruments

Optique et photonique — Spécifications pour jumelles, monoculaires et lunettes —

Partie 2: Instruments haute performance

Reference number
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 172, *Optics and photonics*, Subcommittee SC 4, *Telescopic systems*.

This second edition cancels and replaces the first edition (ISO 14133-2:2006), which has been technically revised with the following changes:

— to reduce the exit pupil diameter to 4,0 mm instead of 4,5 mm;

— to designate "close distance (m)" to the column "required".

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

— *Part 1: General purpose instruments*

— *Part 2: High performance instruments*

Optics and photonics — Specifications for binoculars, monoculars and spotting scopes —

Part 2: High performance instruments

1 Scope

This part of ISO 14133 gives requirements for high performance binoculars, monoculars and spotting scopes. It is not applicable to general purpose binoculars, monoculars and spotting scopes which are specified in ISO 14133-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 14132-1, *Optics and photonics — Vocabulary for telescopic systems — Part 1: General terms and alphabetical indexes of terms in ISO 14132*

ISO 14132-2, *Optics and photonics — Vocabulary for telescopic systems — Part 2: Terms for binoculars, monoculars and spotting scopes*

ISO 14490-1, *Optics and optical instruments — Test methods for telescopic systems — Part 1: Test methods for basic characteristics*

ISO 14490-2, *Optics and optical instruments — Test methods for telescopic systems — Part 2: Test methods for binocular systems*

ISO 14490-7, *Optics and photonics — Test methods for telescopic systems — Part 7: Test methods for limit of resolution*

3 Terms and definitions

For the purposes of this document, the general terms, definitions and symbols given in ISO 14132-1 apply and particular terms and definitions for binoculars, monoculars and spotting scopes given in ISO 14132-2 apply.

4 Specifications

Fundamental requirements are defined by minimum values or tolerances for important characteristics of binoculars, monoculars and spotting scopes.

Tolerances specify maximum deviations between measured and nominal values. Nominal values shall be laid down by the manufacturing or trading company.

Wherever relevant, all tolerances and values refer to measurements made on axis.

Binoculars, monoculars and spotting scopes shall comply with the environmental requirements relative to the respective instrument type, as appropriate. These environmental requirements are specified in ISO 10109-4.

Compliance of the binoculars, monoculars and spotting scopes with the requirements given in Table 1 and Table 2 shall be tested in accordance with the test methods specified in ISO 14490-1, ISO 14490-2 and ISO 14490-7, respectively.

Table 1 — Acceptable deviations of optical characteristics

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

[d] Does not apply to monoculars.