
**Optics and photonics — Telescopic
systems — Specifications for night vision
devices**

*Optique et photonique — Systèmes télescopiques — Spécifications
pour dispositifs de vision de nuit*

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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 2.

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 21094 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 4, *Telescopic systems*.

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Optics and photonics — Telescopic systems — Specifications for night vision devices

1 Scope

This International Standard applies to night vision devices such as binoculars, monoculars and goggles that are used for observation activities at night such as rescue actions under low light conditions, urgent repairs in the dark and night time surveillance.

The International Standard does not cover thermal imaging technology.

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

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

ISO 14132-5¹⁾, *Optics and optical instruments — Vocabulary for telescopic systems — Part 5: Terms for night vision devices*

ISO 14490-8¹⁾, *Optics and photonics — Test methods for telescopic systems — Part 8: Test methods for night-vision devices*

3 Terms and definitions

For terms and definitions that apply to night vision devices refer to ISO 14132-5.

For terms and definitions and reference of letter symbols that apply to telescopic systems in general refer to ISO 14132-1.

For terms and definitions that apply to binocular and monocular systems refer to ISO 14132-2.

1) To be published.

4 Specifications

4.1 General

The tests for compliance of night vision devices to values and tolerances specified in Table 1 and Table 2 shall be carried out in accordance with ISO 14490-8.

4.2 Tolerances

Acceptable deviations of the optical characteristics of night vision devices shall be within the limits given in Table 1.

Table 1 — Acceptable deviations of optical characteristics

Characteristics	Values of tolerances	
	for binoculars and monoculars	for goggles
Magnification ^a , Γ	± 7 %	
Range of vision ^b	± 20 %	
Night vision device gain	± 10 %	
Field of view in the object space	± 5%	± 10%
Eye relief, in millimetres	-1 to +5	
Zero-setting error of diopetre scale, in dioptres	± 1,0	
Image rotation, in degrees of arc	± 1,5	
Disparity of image rotations ^c , in minutes of arc	40	
Relative difference in magnification ^c	2 %	3 %
Non-parallelism of axes of beams emergent from eyepieces ^c , in minutes of arc:		
dipvergence	30	
divergence	100	
convergence	40	
^a For variable (zoom or discrete) magnification instruments this refers to minimum and maximum magnifications. ^b For variable (zoom or discrete) magnification instruments this refers to the maximum magnification. ^c Not applicable for monoculars.		

4.3 Minimum requirements for optical characteristics

Values of optical characteristics for night vision devices shall be not less of those given in Table 2.

Table 2 — Minimum requirements to optical characteristics

Characteristics		Values	
		for binoculars and monoculars	for goggles
Limit of resolution in object space ^{a, b}	in minutes of arc	$(\frac{6}{\Gamma})$	
	in cycles per milliradian	$(\frac{0,6}{\Gamma})$	
Dioptre adjustment range, in dioptres		-4 to +2	-5 to +2
Eye relief, in millimetres		12	15
Range of interpupillary distance adjustment, in millimetres ^{c, d}		60 to 70	
Close distance, in metres		-	0,3
Imperfections in the field of view ^e		Three spots maximum 0,1 mm in diameter are acceptable in the central area equal to 1/3 of the screen diameter. For the rest of the screen two spots maximum 0,3 mm or ten spots maximum 0,2 mm in diameter are acceptable.	
<p>^a For variable (zoom or discrete) magnification instruments this refers to the maximum magnification.</p> <p>^b The limit of resolution is defined for the centre of the field of view under the optimal object irradiance, the optimum voltage on the image intensifier, the specified contrast and the maximum magnification.</p> <p>^c The range of interpupillary distance adjustment may not exist when the exit pupil diameter is large enough (above 10 mm).</p> <p>^d Not applicable to monoculars.</p> <p>^e The specification of spot sizes in minutes of arc calculated under condition that the focal length of eyepiece is 25 mm and rounded off to the whole number of minutes, is acceptable.</p>			

5 Consumer information

5.1 Designation and marking

Table 3 — Designation and marking

Characteristics	Designation and marking	
	required	recommended
Magnification or range of magnifications ^a	×	
Name of the manufacturer or registered trade mark	×	
Country of origin		×
Serial number		×
Name of the product	×	
^a Not applicable for instruments with interchangeable lenses and/or eyepieces.		

5.2 Information about the product

Table 4 — Information about the product

Characteristics	Information	
	required	recommended
Magnification or range of magnifications ^a	×	
Name of the manufacturer or registered trade mark	×	
Country of origin		×
Serial number		×
Name of the product	×	
Field of view in the object space, in degrees of arc	×	
Eye relief at 1 mm reference aperture diameter, in millimetres	×	
Alternative eye relief and reference aperture diameter ^b , in millimetres		×
Range of vision, in metres	×	
Limit of resolution, in minutes of arc or cycles per milliradians	×	
Night vision device gain		×
Range of interpupillary distance adjustment ^c , in millimetres	×	
Close distance, in metres	×	
Dioptre adjustment range, in dioptres	×	
Continuous work time, in hours	×	
Overall size, in millimetres	×	
Mass or weight, in grams	×	
Operational temperature range, in degrees centigrade	×	
Water and moisture resistance	×	
Type of power supply	×	
Type of emitter ^b	×	
Safety	×	
Maximum radiance (of the scene)	×	
Spectral sensitivity		×
Lifetime, in years		×

^a Not applicable for instruments with interchangeable lenses and/or eyepieces.
^b If applicable.
^c Not applicable for monoculars.

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