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Optics and photonics — Environmental requirements — Test requirements for telescopic systems

Optique et photonique — Prescriptions d'environnement — Prescriptions d'essai pour les systèmes télescopiques

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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 voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This first edition of ISO 20711 cancels and replaces ISO 10109-4:2001, which has been technically revised.

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Introduction

Optical and photonic instruments including additional assemblies from other fields (e.g. mechanical, chemical and electronic devices) are affected during their use by a number of different environmental and handling parameters which they are required to resist without significant reduction in performance and to remain within defined specifications. This is what the manufacturer attempts to ensure and the user expects to receive.

This expectation can be assessed by exposure of the instrument to a range of simulated environmental parameters under controlled laboratory conditions. The cumulative combination, degree of severity and sequence of these conditions can be selected to obtain meaningful results in a relatively short period of time.

Technical requirements as given in the tables of this document are abbreviated and the reader has to consult the referenced standards (i.e. the relevant parts of ISO 9022) for the full specification of the technical requirement.

For the purposes of this document, nominal values for properties or performance characteristics are understood to be the manufacturer's internal technical data and do not directly reflect the manufacturer's product specifications.

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Optics and photonics — Environmental requirements — Test requirements for telescopic systems

1 Scope

This document specifies requirements to be met with regard to resistance of the optical, mechanical, chemical and electrical properties or performance data of instruments to environmental influences and hence determines geographical and technical areas of application. It applies to consumer telescopic systems and accessories, such as hunting and sporting products.

Environmental test methods as specified in relevant parts of ISO 9022 are assigned to the various areas of application for the purpose of ascertaining the suitability of the instruments in their respective area of application.

This document is the basis for the specification of environmental requirements and environmental tests in instrument standards. If necessary, these requirements and tests can be amended in the instrument standards.

This document does not deal with the requirements to be met by the packaging of the instrument during transport from the manufacturer to the user.

NOTE Nominal values of properties and performance characteristics as understood by this document are predetermined by specifications provided by the manufacturer, technical terms of delivery and instrument standards.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 9022-1, *Optics and photonics — Environmental test methods — Part 1: Definitions, extent of testing*

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

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

ISO 9022-4, *Optics and photonics — Environmental test methods — Part 4: Salt mist*

ISO 9022-7, *Optics and photonics — Environmental test methods — Part 7: Resistance to drip or rain*

ISO 9022-8, *Optics and photonics — Environmental test methods — Part 8: High internal pressure, low internal pressure, immersion*

ISO 9022-9, *Optics and photonics — Environmental test methods — Part 9: Solar radiation and weathering*

ISO 9022-12, *Optics and photonics — Environmental test methods — Part 12: Contamination*

ISO 10109, *Optics and photonics — Guidance for the selection of environmental tests*

ISO 14133-1, *Optics and photonics — Specifications for binoculars, monoculars and spotting scopes — Part 1: General purpose instruments*

ISO 14133-2, *Optics and photonics — Specifications for binoculars, monoculars and spotting scopes — Part 2: High performance instruments*

ISO 14134, *Optics and optical instruments — Specifications for astronomical telescopes*

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ISO 14135-1, *Optics and photonics — Specifications for telescopic sights — Part 1: General-purpose instruments*

ISO 14135-2, *Optics and photonics — Specifications for telescopic sights — Part 2: High-performance instruments*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10109 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
extent of testing
sum of all required tests to ascertain operability, as well as product performance within the intended use and life span

Note 1 to entry: The extent of testing is subdivided into type (or sample) testing and series testing.

[SOURCE: ISO 10109:2015, 2.3, modified.]

3.2
type testing
sample testing
extent of testing required of initial or qualification samples sufficient to ascertain whether the instrument complies with all the environmental requirements of the relevant specification

Note 1 to entry: Type (or sample) testing is designated by the code letter T.

3.3
series testing
extent of testing required of ensure constant production quality

Note 1 to entry: Sampling procedures can be used.

Note 2 to entry: Series testing is designated by the code letter S.

4 Subdivision of the instrument group "telescopic systems"

The group telescopic systems is subdivided into instrument types with the type numbers given in Table 1.

Table 1 — Subdivision of telescopic systems

Type number	Instrument type
01	**Binoculars, monoculars and spotting scopes** which are designed for occasional use in moderate environments by users such as tourists and spectators of sporting events, etc.
02	**Binoculars, monoculars and spotting scopes** which are designed for continuous use in moderately harsh environments by professional users as, for example, emergency personnel, ship's captains and forest rangers, etc.
03	**Telescopic sights for airguns** which are designed for mounting on airguns and for use in moderate environments, mainly in sports.
04	**Telescopic sights for rifles and handguns** which are designed for mounting on rifles and handguns and for hunting.

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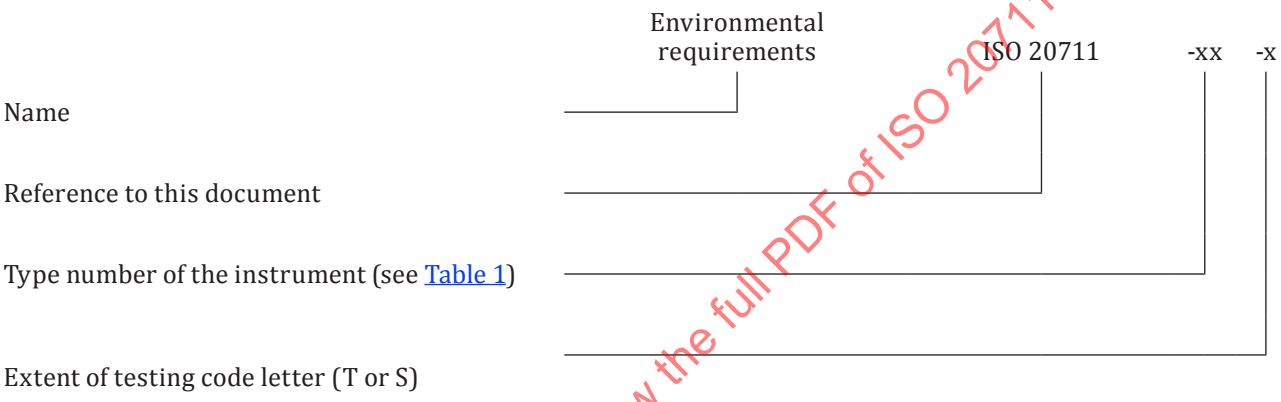
Table 1 *(continued)*

Type number	Instrument type
05	**Telescopic sights for extreme conditions of use** which are designed for mounting on rifles and handguns and for consumer use in severe environmental conditions.
06	**Amateur astronomical telescopes** which are designed for occasional use in moderate environments.
07	**Amateur astronomical telescopes** which are designed for continuous use in moderately harsh environments.

5 Designation of environmental requirements and environmental tests

The designation for environmental requirements shall be formed as follows:



The relevant specification and other technical documents shall indicate the environmental requirements applicable to this document using the above designation.

EXAMPLE Environmental requirement designation for telescopic systems, type number of the instrument type 02 and the extent of testing T:

Environmental requirements ISO 20711-02-T

In relevant specifications and other technical documentation, tests carried out in accordance with the environmental requirements given in this document shall be designated by the environmental test code as specified in ISO 9022-1.

6 Specification of technical requirements and appropriate environmental tests

6.1 Acceleration of free fall

For the purposes of this document, the acceleration of free fall shall be taken as g = 9,81 m/s^2.

6.2 Binoculars, monoculars and spotting scopes (instrument types 01 and 02)

Table 2 specifies technical requirements and corresponding environmental tests for extent of testing T (type or sample test).

After testing in accordance with Table 2, the instrument shall meet the specifications of either ISO 14133-1 or ISO 14133-2.

Series tests (extent of testing S) shall be stipulated in the relevant specification.

Table 3 shows a summary of the tests given in Table 2 as specified in ISO 9022.

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Table 2 — Environmental requirements for binoculars, monoculars and spotting scopes for extent of testing T

Serial No.	ISO 9022		Type No.		01			02		
	Part	Conditioning method	State of operation		0	1	2	0	1	2
1	2	10 Cold	Technical requirements	Temperature °C	−40	—	−10	−40	—	−25
			Degree of severity		08	—	02	08	—	05
			Comment							
2	2	11 Dry heat	Technical requirements	Temperature °C	55	—	55	70	—	55
			Degree of severity		03	—	03	05	—	03
			Comment							
3	2	12 Damp heat	Technical requirements	Temperature °C Relative humidity %	— —	40 92	— —	— —	55 92	— —
			Degree of severity		—	01	—	—	07	—
			Comment							
4	2	15 Temperature shock	Technical requirements	Temperature °C t_2 t_1	— —	20 −10	— —	— —	40 −25	— —
			Degree of severity		—	01	—	—	02	—
			Comment							
5	9	20 Solar radiation	Technical requirements	Irradiance kW/m²	—	up to 1,1	—	—	up to 1,1	—
			Degree of severity		—	02	—	—	02	—
			Comment							
6	9	21 Laboratory weathering	Technical requirements	Exposure time h	—	2 000	—	—	2 000	—
			Degree of severity		—	01	—	—	01	—
			Comment		This requirement applies to instruments that are operated in continuous, long-term outdoor use					
7	3	30 Shock	Technical requirements	Acceleration g Duration ms	— —	30 6	— —	— —	100 6	— —
			Degree of severity		—	03	—	—	07	—
			Comment							
8	3	31 Bump	Technical requirements	Acceleration g Duration ms	— —	10 6	— —	— —	25 6	— —
			Degree of severity		—	01	—	—	05	—
			Comment							
9	3	32 Drop and topple	Technical requirements	Height of overturn mm	—	Toppling over	—	—	Toppling over	—
			Degree of severity		—	04	—	—	04	—
			Comment							
10	3	33 Free fall	Technical requirements	Height of fall mm	—	—	—	250	—	—
			Degree of severity		—	—	—	04	—	—
			Comment							
11	3	36 Sinusoidal vibration (sweep frequencies)	Technical requirements	Frequency Hz Acceleration g	— —	10 to 150 2	— —	— —	10 to 150 2	— —
			Degree of severity		—	03	—	—	03	—
			Comment							

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Table 2 *(continued)*

Serial No.	ISO 9022		Type No.		01			02		
	Part	Conditioning method	State of operation		0	1	2	0	1	2
12	4	40 Salt mist	Technical requirements	Corrosion resistance	Ability to be operated for ≥5 years in compliance with stipulated instructions regarding maintenance and care.					
			Degree of severity		—	01	—	—	03	—
			Comment		Parts (materials) are tested.					
13	7	73 Steady rain	Technical requirements	Rain rate mm/min	—	5	—	—	20	—
			Degree of severity		—	01	—	—	02	—
			Comment		This requirement applies to instruments that are declared waterproof.					
14	8	80 High internal pressure	Technical requirements	Difference from ambient pressure hPa	—	—	—	—	100	—
			Degree of severity		—	—	—	—	02	—
			Comment		This requirement applies to instruments that are declared waterproof.					
15	8	81 Low internal pressure	Technical requirements	Difference from ambient pressure hPa	—	—	—	—	100	—
			Degree of severity		—	—	—	—	04	—
			Comment		This requirement applies to instruments that are declared waterproof.					
16	8	82 Immersion	Technical requirements	Immersion depth m	—	—	—	—	4	—
			Degree of severity		—	—	—	—	02	—
			Comment		This requirement applies to instruments that are declared waterproof.					
17	12	86 Basic cosmetic substances and artificial hand sweat	Technical requirements	Ability to be operated for ≥5 years in compliance with stipulated instructions regarding maintenance and care.						
			Degree of severity		—	03	—	—	03	—
			Comment							

Table 3 — Test summary for binoculars, monoculars and spotting scopes

Environmental requirement ISO 20711-01-T	Environmental requirement ISO 20711-02-T	Part of ISO 9022
Environmental test ISO 9022		
10-08-0	10-08-0	ISO 9022-2
10-02-2	10-05-2	
11-03-0	11-05-0	
11-03-2	11-03-2	
12-01-1	12-07-1	
15-01-1	15-02-1	
20-02-1	20-02-1	ISO 9022-9
21-01-1	21-01-1	
30-03-1	30-07-1	ISO 9022-3
31-01-1	31-05-1	
32-04-1	32-04-1	
	33-04-0	
36-03-1	36-03-1	

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Table 3 *(continued)*

Environmental requirement ISO 20711-01-T	Environmental requirement ISO 20711-02-T	Part of ISO 9022
Environmental test ISO 9022		
40-01-1	40-03-1	ISO 9022-4
73-01-1	73-02-1	ISO 9022-7
	80-02-1 81-04-1 82-02-1	ISO 9022-8
86-03-1	86-03-1	ISO 9022-12

6.3 Telescopic sights (instrument type 03, 04 and 05)

Table 4 specifies technical requirements and corresponding environmental tests for extent of testing T (type or sample test).

After testing in accordance with Table 4, the instrument shall meet the specifications of either ISO 14135-1 or ISO 14135-2.

Series tests (extent of testing S) shall be stipulated in the relevant specification.

Table 5 shows a summary of the tests given in Table 4 as specified in ISO 9022.

Table 4 — Environmental requirements for telescopic sights

Serial No.	ISO 9022 Part	ISO 9022 Conditioning method	Type no. / State of operation		03 0	03 1	03 2	04 0	04 1	04 2	05 0	05 1	05 2
1	2	10 Cold[a]	Technical requirements	Temperature °C	−40	—	0	−40	—	−10	−40	—	−25
			Degree of severity		08	—	01	08	—	02	08	—	05
			Comment										
2	2	11 Dry heat[a]	Technical requirements	Temperature °C	55	—	40	55	—	55	70	—	55
			Degree of severity		03	—	02	03	—	03	05	—	03
			Comment										
3	2	12 Damp heat[a]	Technical requirements	Temperature °C Relative humidity %	— —	40 92	— —	— —	40 92	— —	— —	55 92	— —
			Degree of severity		—	01	—	—	01	—	—	07	—
			Comment										
4	2	15 Temperature shock[a]	Technical requirements	Temperature °C t_2 t_1	— —	20 −10	— —	— —	40 −25	— —	— —	55 −40	— —
			Degree of severity		—	01	—	—	02	—	—	03	—
			Comment										
5	2	16 Damp heat cyclic[a]	Technical requirements	Temperature °C relative humidity %	— —	— —	— —	— —	— —	— —	— —	40 92	— —
				Temperature °C relative humidity %	— —	— —	— —	— —	— —	— —	— —	23 83	— —
			Degree of severity		—	—	—	—	—	—	—	02	—

[a] Type or sample test and series test.

[b] Type or sample test or series test.

[c] Type or sample test only.

[d] Up to 1 000 g according to the relevant specification of the manufacturer.

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