INTERNATIONAL STANDARD

ISO 9022

Redline version
compares Second edition to
First edition

Optics and photonics — Environmental test methods —

Part 14: Dew, hoarfrost, ice

Optique et photonique — Méthodes d'essais d'environnement — Partie 14: Rosée, givre, glace

Reference number
ISO 9022:redline:2015(E)

IMPORTANT — PLEASE NOTE

This is a mark-up copy and uses the following colour coding:

Text example 1	— indicates added text (in green)
~~Text example 2~~	— indicates removed text (in red)
	— indicates added graphic figure
	— indicates removed graphic figure
1.x ...	— Heading numbers containg modifications are highlighted in yellow in the Table of Contents

DISCLAIMER

This Redline version provides you with a quick and easy way to compare the main changes between this edition of the standard and its previous edition. It doesn't capture all single changes such as punctuation but highlights the modifications providing customers with the most valuable information. Therefore it is important to note that this Redline version is not the official ISO standard and that the users must consult with the clean version of the standard, which is the official standard, for implementation purposes.

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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).

~~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. 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

~~International Standard~~The committee ~~ISO 9022-14 was prepared by Technical Committee~~responsible for this document is ISO/TC 172, *Optics and* ~~*optical*~~ photonics~~*instruments*~~, Subcommittee SC 1, *Fundamental standards*~~.~~.

This second edition cancels and replaces the first edition (ISO 9022-14:1994), of which it constitutes a minor revision.

ISO 9022 consists of the following parts, under the general title *Optics and* ~~*optical instruments*~~photonics — *Environmental test methods*~~:~~

— *Part 1: Definitions, extent of testing*

— *Part 2: Cold, heat* and *humidity*

— *Part 3: Mechanical stress*

— *Part 4: Salt mist*

— *Part* ~~*5: Combined cold*~~6: Dust~~, low air pressure~~

~~— *Part 6: Dust*~~

— *Part 7:* ~~*Drip*~~Resistance to drip or *rain*

— *Part 8: High* internal *pressure, low* internal *pressure, immersion*

— *Part 9: Solar radiation* and weathering

~~— *Part 10: Combined sinusoidal vibration, dry heat or cold*~~

— *Part 11: Mould growth*

— *Part 12: Contamination*

— *Part 13: Combined shock, bump or free fall, dry heat or cold*

— *Part 14: Dew, hoarfrost, ice*

— *Part 15: Combined random vibration wide band: reproducibility medium, in dry heat or cold*

— *Part 16: Combined bounce or steady-state acceleration, in dry heat or cold*

— *Part 17: Combined contamination, solar radiation*

— *Part* 18: Combined damp heat and low internal pressure20: Humid atmosphere containing sulfur dioxide or hydrogen sulphide

— *Part* 19: Temperature cycles combined with sinusoidal22: Combined cold, dry heat or temperature change with bump *or random vibration*

— *Part* 20: Humid atmosphere containing sulfur dioxide or hydrogen sulfide23: Low pressure combined with cold, ambient temperature and dry and damp heat

Annex A of this part of ISO 9022 is for information only.

Introduction

Optical instruments are affected during their use by a number of different environmental parameters which they are required to resist without significant reduction in performance and to remain within defined specifications.

The type and severity of these parameters depend on the conditions of use of the instrument (for example, in the laboratory or workshop) and on its geographical location. The environmental effects on optical instrument performance in the tropics and subtropics are totally different from those found when they are used in ~~the~~ arctic regions. Individual parameters cause a variety of different and overlapping effects on instrument performance.

The manufacturer attempts to ensure, and the user naturally expects, that instruments will resist the likely rigours of their environment throughout their life. This expectation can be assessed by exposure of the instrument to a range of simulated environmental parameters under controlled laboratory conditions. The severity of these conditions is often increased to obtain meaningful results in a relatively short period of time.

In order to allow assessment and comparison of the response of optical instruments to appropriate environmental conditions, ISO 9022 contains details of a number of laboratory tests which reliably simulate a variety of different environments. The tests are based largely on IEC standards, modified where necessary to take into account features special to optical instruments.

~~It should be noted that, as~~As a result of continuous progress in all fields, optical instruments are no longer only precision-engineered optical products, but, depending on their range of application, also contain additional assemblies from other fields. For this reason, the principal function of the instrument ~~must~~is to be assessed to determine which International Standard should be used for testing. If the optical function is of primary importance, then ISO 9022 is applicable, but if other functions take precedence then the appropriate International Standard in the field concerned should be applied. Cases ~~may~~can arise where application of both ISO 9022 and other appropriate International Standards will be necessary.

Optics and photonics — Environmental test methods —

Part 14:
Dew, hoarfrost, ice

1 Scope

This part of ISO 9022 specifies ~~methods for the testing~~the methods relating to the environmental tests of optical instruments ~~and instruments containing optical elements~~including additional assemblies from other fields (e.g. mechanical, chemical, and electronic devices) under equivalent conditions, for their ability to resist the influence of dew, hoarfrost or ice.

The purpose of testing is to investigate to what extent the optical, ~~thermal~~climatic, mechanical, chemical, and electrical (including electrostatic) performance characteristics of the specimen are affected by dew, hoarfrost, or ice.

2 Normative references

The following ~~standards contain provisions which, through reference in this text, constitute provisions of this part of~~documents, in whole or in part, are normatively referenced in this document ~~ISO 9022. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of~~and are indispensable for its application. For dated references, ~~ISO 9022 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards~~only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9022-1~~:1994~~[1], *Optics and ~~optical instruments~~photonics — Environmental test methods — Part 1: Definitions, extent of testing*~~:~~

ISO 9022-4~~:1994~~[2], *Optics and ~~optical instruments~~photonics — Environmental test methods — Part 4: Salt mist*~~:~~

3 General information and test conditions

Exposure to dew, hoarfrost, or ice is effected by rapid change of the environmental conditions in a chamber or by transferring the specimen from a cold chamber to a conditioned room. Instrument parts not exposed to hoarfrost or icing conditions during normal use should be protected from exposure to such conditions during test.

4 Conditioning

Table 1 shows the conditioning methods 75 (dew), 76 (hoarfrost followed by the process of thawing), and 77 (ice covering followed by the process of thawing). Conditioning method 77 (ice covering followed by the process of thawing) includes two types of ice formation (see Annex A for details)~~:~~:

— rime ice: degree of severity 01 applies;

— glazed ice: degrees of severity 02 to 04 apply.

1) ~~To be published.~~

2) ~~To be published.~~

~~Table 1 — Degrees of severity for conditioning methods 75, 76, and 77~~

Conditioning method			75	76			77			
Step 1	Degree of severity		01	01	02	03	01	02	03 [1]	04 [1]
	Test chamber temperature	°C	10 ± 2	− 10 ± 2	− 25 ± 3		− 15 ± 3		− 25 ± 3	
	Exposure time		Until specimen has reached a temperature within 3 °C of the test chamber temperature[2]							
Step 2	Test chamber temperature	°C	Not applicable			− 5 ± 2			− 15 ± 3	− 25 ± 3
	Hoarfrost, rime ice, or glazed ice build-up on test surfaces[3]	mm				0,5 to 2	2 to 4	5 to 7	20 to 30	≥ 75
	Exposure time					Until the specimen has reached a temperature within 3 °C of the test chamber temperature[2].				
Step 3	Test chamber temperature	°C				30 ± 2				
	Relative humidity	%				80 to 95				
	Exposure time		Until specimen has reached a temperature within 3 °C of the test chamber temperature[2].							
State of operation						1 or 2				

1) Only applicable for outside-mounted naval equipment.

2) Where heat-dissipating specimens are involved, temperature soaking shall be deemed to be satisfactory if, at stabilized test chamber temperature, the temperature of the specimen does not change by more than 3 °C within one hour.

3) Test surfaces as specified by the relevant specification.

Table 1 — Degrees of severity for conditioning methods 75, 76, and 77

Conditioning method		75	76			77			
Step 1	Degree of severity	01	01	02	03	01	02	03[a]	04[a]
	Test chamber temperature °C	10 ± 2	−10 ± 2	−25 ± 3		−15 ± 3		−25 ± 3	
	Exposure time	Until specimen has reached a temperature within 3 °C of the test chamber temperature[b].							

[a] Only applicable for outside-mounted naval equipment.

[b] Where heat-dissipating specimens are involved, temperature soaking shall be deemed to be satisfactory if, at stabilized test chamber temperature, the temperature of the specimen does not change by more than 3 °C within one hour.

[c] Test surfaces as specified by the relevant specification.

Conditioning method		75	76	77				
Step 2	Test chamber temperature °C	Not applicable		−5 ± 2			−15 ± 3	−25 ± 3
	Hoarfrost, rime ice, or glazed ice build-up on test surfaces[c] mm			0,5to 2	2 to 4	5to 7	20to 30	≥75
	Exposure time			Until the specimen has reached a temperature within 3 °C of the test chamber temperature[b].				
Step 3	Test chamber temperature °C	30 ± 2						
	Relative humidity %	80 to 95						
	Exposure time	Until specimen has reached a temperature within 3 °C of the test chamber temperature[b].						
State of operation		1 or 2						

a Only applicable for outside-mounted naval equipment.

b Where heat-dissipating specimens are involved, temperature soaking shall be deemed to be satisfactory if, at stabilized test chamber temperature, the temperature of the specimen does not change by more than 3 °C within one hour.

c Test surfaces as specified by the relevant specification.

5 Procedure

5.1 General

The test shall be conducted in accordance ~~to~~with the requirements of the relevant specification and with ISO 9022-1.

5.2 Preconditioning

Unless otherwise specified in the relevant specification, the surface of the specimen shall be properly cleaned using nonresidue neutral cleaning agents only. After cleaning, the specimen shall be restored to service condition (as, for instance, by applying protecting grease, etc.).

5.3 Test sequence

5.3.1 Conditioning method 75, degree of severity 01; conditioning method 76, degrees of severity 01 and 02

After temperature stabilization in step 1, immediately expose the specimen to the environmental conditions of step 3. This ~~may~~can be done by transferring the specimen to a conditioned room or changing the test chamber conditions.