INTERNATIONAL STANDARD

ISO 9022-1

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Optics and optical instruments — Environmental test methods —

Part 1: Definitions, extent of testing

Optique et instruments d'optique — Méthodes d'essais d'environnement —
Partie 1: Définitions, portée des essais

Reference number
ISO 9022-1:1994(E)

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.

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.

International Standard ISO 9022-1 was prepared by Technical Committee ISO/TC 172, *Optics and optical instruments*, Subcommittee SC 1, *Fundamental standards*.

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

— *Part 1: Definitions, extent of testing*

— *Part 2: Cold, heat, humidity*

— *Part 3: Mechanical stress*

— *Part 4: Salt mist*

— *Part 5: Combined cold, low air pressure*

— *Part 6: Dust*

— *Part 7: Drip, rain*

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

— *Part 9: Solar radiation*

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

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— *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 pressure*

— *Part 19: Temperature cycles combined with sinusoidal or random vibration*

— *Part 20: Humid atmosphere containing sulfur dioxide or hydrogen sulfide*

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.

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 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 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 arise where application of both ISO 9022 and other appropriate International Standards will be necessary.

Optics and optical instruments — Environmental test methods —

Part 1:
Definitions, extent of testing

1 Scope

This part of ISO 9022 defines terms relating to environmental tests of optical instruments and of instruments including optical assemblies and optical components, and specifies basic features of testing.

2 Definitions

For the purposes of ISO 9022, the following definitions apply.

2.1 environmental test: Laboratory simulation, usually severe, of the climatic, mechanical, biological and chemical environmental influences acting on the specimen during assembly, storage, transport and operation, in order to establish any changes in the behaviour of the specimen in a short time.

2.2 optical instrument: Instrument whose function is mainly based on optical phenomena. As a rule, the instrument consists of several assemblies and/or components. Optical instruments also include illumination systems, instruments with light conduction and instruments which, apart from optical units, contain assemblies and/or components from other fields, e.g. electronic components.

2.3 optical assembly: Functional unit consisting of several components, at least one of which has an optical function.

2.4 component (of an optical instrument)**:** Smallest unit generally consisting of one piece and one material.

2.5 representative sample: Sample, e.g. an optical part or piece of sheet metal, which differs from a component only in its geometry.

2.6 specimen: Instrument, assembly, component or representative sample which is being tested.

2.7 test: Procedure by which the effect of applied parameters on the properties of a specimen is determined and assessed.

2.8 conditioning: Sum of the external influences acting on the specimen during the test, such as the conditioning method and degree of severity employed, and of the internal influences resulting from the state of operation of the specimen, such as movements and/or temperature changes.

2.8.1 conditioning method: Individual or combined environmental influence(s) to which the specimen is submitted during the test, e.g. shock or damp heat.

2.8.2 degree of severity: Parameter containing all the individual quantities required for the test, e.g. temperature, humidity, conditioning time.

Conditioning time (exposure time) is a minimum time if no tolerance is indicated in the relevant parts of this International Standard.

2.8.3 state of operation: State defining the operating status of the specimen during conditioning. Three states of operation are distinguished.

2.8.3.1 state of operation 0: Specimen is in its normal transport and/or storage container as provided by the manufacturer.

2.8.3.2 state of operation 1: Specimen is unprotected and ready for operation, but power supply is not connected.

2.8.3.3 state of operation 2: Specimen is operating during the test for a period to be determined in the relevant specification. The mode of the operating status is given in the relevant specification. During operation, correct functioning of the specimen is checked.

2.9 examinations and tests: Determination of the properties and functions of a specimen for the purpose of subsequent evaluation. There are three types of examinations and tests: visual examination, fucntion test and measurement.

2.9.1 visual examination: Examination which uses the human eye as a detector.

2.9.2 function test: Determination of functionability.

2.9.3 measurement: Objective determination of the value of a physical quantity by comparison with a specified quantity.

2.10 evaluation: Evaluating comparison of the results measured either with one another or with specified tolerances to be kept to in initial, intermediate and final tests.

2.11 relevant specification: Compilation of all data referring to the specimen and necessary for testing, agreed upon by both parties to the contract.

2.12 ambiant atmospheric conditions: Conditions defined by the temperature range between 15 °C and 35 °C at a relative air humidity between 30 % and 75 %.

3 Procedure

3.1 Test sequence

Unless the relevant part of ISO 9022 or the relevant specification gives different directions for the test sequence, the test shall be performed in accordance with 3.2 to 3.8 . Preconditioning, recovery, initial and final tests shall be carried out at as constant ambient atmospheric conditions as possible.

3.2 Preconditioning (specimen preparation)

Preconditioning brings the specimen into the state necessary for initial testing and conditioning, e.g. cleaning of the exterior of the specimen, drying of the interior of the specimen, changing of the desiccator cartridges, greasing of the areas liable to corrosion. The temperature of the specimen shall be adjusted to the ambient temperature to within 3 K.

3.3 Initial test

After preconditioning, an examination shall be performed according to the relevant specification. This shall include a visual examination for damage such as scratches on optical parts or cracks in other materials, which might influence the behaviour of the specimen.

3.4 Conditioning

After the initial test the specimen shall be submitted to the conditioning method at the defined degree of severity and the state of operation given in the relevant specification.

3.5 Intermediate test (in state of operation 2 only)

The specimen shall be submitted to a test during conditioning according to the relevant specification.

3.6 Recovery

Recovery shall bring the specimen into the state required for final testing, e.g. temperature adjustment to within 3 K of the preconditioning temperature.

3.7 Final test

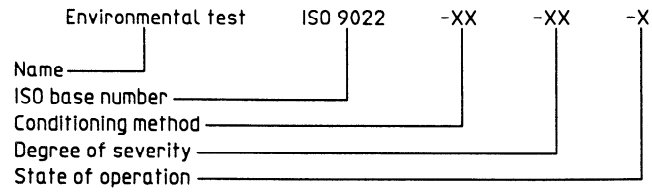
After recovery, a test shall be carried out according to the relevant specification.

3.8 Evaluation

The specimen shall have passed the test if the evaluation criteria laid down in the relevant specification have been met.

4 Environmental test code

The code for environmental tests shall be formed as follows:



Annex A
(informative)

List of parts of ISO 9022 and relevant conditioning methods

Part 2: Cold, heat, humidity

Conditioning method	10:	Cold
	11:	Dry heat
	12:	Damp heat
	13:	Condensed water
	14:	Slow temperature change
	15:	Rapid temperature change
	16:	Damp heat, cyclic

Part 3: Mechanical stress

Conditioning method	30:	Shock
	31:	Bump
	32:	Drop and topple
	33:	Free fall
	34:	Bounce
	35:	Steady-state acceleration, centrifugal
	36:	Sinusoidal vibration
	37:	Random vibration (wide band), reproducibility: medium

Part 4: Salt mist

Conditioning method	40:	Salt mist

Part 5: Combined cold, low air pressure

Conditioning method	50:	Combined cold, low air pressure including hoarfrost and dew
	51:	Combined cold, low air pressure without hoarfrost and dew

Part 6: Dust

Conditioning method	52:	Blowing dust

Part 7: Drip, rain

Conditioning method	72:	Drip
	73:	Steady rain
	74:	Driving rain

Part 8: High pressure, low pressure, immersion

Conditioning method	80:	High internal pressure
	81:	Low internal pressure
	82:	Immersion

Part 9: Solar radiation

Conditioning method	20:	Solar radiation

Part 10: Combined sinusoidal vibration, dry heat or cold

Conditioning method
- 61: Combined sinusoidal vibration, dry heat
- 62: Combined sinusoidal vibration, cold

Part 11: Mould growth

Conditioning method
- 85: Mould growth

Part 12: Contamination

Conditioning method
- 86: Basic cosmetic substances and artificial hand sweat
- 87: Laboratory agents
- 88: Production plant resources
- 89: Fuels and resources for aircraft, naval vessels and land vehicles

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

Conditioning method
- 64: Combined shock, dry heat
- 65: Combined bump, dry heat
- 66: Combined shock, cold
- 67: Combined bump, cold
- 68: Combined free fall, dry heat
- 69: Combined free fall, cold

Part 14: Dew, hoarfrost, ice

Conditioning method
- 75: Dew
- 76: Hoardfrost, followed by process of thawing
- 77: Ice, followed by process of thawing

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

Conditioning method
- 70: Combined random vibration wide band, dry heat
- 71: Combined random vibration wide band, cold

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

Conditioning method
- 57: Combined bounce, dry heat
- 58: Combined bounce, cold
- 59: Combined steady-state acceleration, dry heat
- 60: Combined steady-state acceleration, cold

Part 17: Combined contamination, solar radiation

Conditioning method
- 90: Basic cosmetic substances and artificial hand sweat, combined with solar radiation
- 91: Fuels and other resources for aircraft, naval vessels and land vehicles, combined with solar radiation

Part 18: Combined damp heat and low internal pressure

Conditioning method
- 47: Damp heat and low internal pressure, pressure difference low
- 48: Damp heat and low internal pressure, pressure difference medium
- 49: Damp heat and low internal pressure, pressure difference high

Part 19: Temperature cycles combined with sinusoidal or random vibration

Conditioning method
- 53: Combination of temperature cycles with sinusoidal vibration
- 54: Combination of temperature cycles with random vibration: narrow band
- 55: Combination of temperature cylces with random vibration: wide band

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