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Optics and photonics — Environmental test methods —

Part 1: Definitions, extent of testing

Optique et photonique — Méthodes d'essais d'environnement —

Partie 1: Définitions, portée des essais

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Foreword

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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).

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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 1, *Fundamental standards*.

This third edition cancels and replaces the second edition (ISO 9022-1:2012), which has been revised to reflect the changes made to the ISO 9022 series.

ISO 9022 consists of the following parts, under the general title *Optics and 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 6: Dust*

— *Part 7: Resistance to drip or rain*

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

— *Part 9: Solar radiation and weathering*

— *Part 11: Mould growth*

— *Part 12: Contamination*

— *Part 14: Dew, hoarfrost, ice*

— *Part 17: Combined contamination, solar radiation*

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

— *Part 22: Combined cold, dry heat or temperature change with bump or random vibration*

— *Part 23: Low pressure combined with cold, ambient temperature and dry or damp heat*

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 tropical and subtropical climates 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 specific to optical instruments.

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

Optics and photonics — Environmental test methods —

Part 1:
Definitions, extent of testing

1 Scope

This part of ISO 9022 defines terms relating to environmental tests of optical and photonic instruments, including additional assemblies from other fields (e.g. mechanical, chemical and electronic devices), and specifies basic features of testing.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
environmental test
laboratory simulation, usually severe, of the climatic, mechanical, biological, electrical (including electrostatic) 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
photonic instrument
instrument whose function is mainly based on optical phenomena, consisting of several assemblies and/or components, illumination systems, instruments with light conduction and instruments which, apart from optical units, contain assemblies and/or components from other fields

EXAMPLE Electronic components.

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

2.4
component
<optical instrument> smallest unit, generally consisting of one piece and one material

2.5
representative sample
sample which differs from a component only in its geometry

EXAMPLE An optical part or piece of sheet metal.

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 influences to which the specimen is submitted during the test

EXAMPLE Shock or damp heat.

2.8.2
degree of severity
parameter containing all the individual quantities required for the test

EXAMPLE Temperature, humidity, conditioning time.

Note 1 to entry: Conditioning time (exposure time) is the minimum time if no tolerance is indicated in the relevant parts of ISO 9022.

2.8.3
state of operation
state defining the operating status of the specimen during conditioning

Note 1 to entry: Three states of operation are distinguished: state of operation 0, state of operation 1 and state of operation 2.

2.8.3.1
state of operation 0
state whereby the specimen is in its normal transport and/or storage container and/or shipping package respectively as provided by the manufacturer

2.8.3.2
state of operation 1
state whereby the specimen is unprotected and ready for operation, but power supply is not connected

2.8.3.3
state of operation 2
state whereby the specimen is operating during the test for a period to be determined in the relevant specification

Note 1 to entry: 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

Note 1 to entry: There are three types of examinations and tests: visual examination, function test and measurement.

2.9.1
visual examination
examination which uses the human eye as a detector

2.9.2
function test
determination of functionality

2.9.3
measurement
objective determination of the value of a physical quantity by comparison with a specified quantity

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

2.11
relevant specification
compilation of all data referring to the specimen and necessary for testing

2.12
ambient atmospheric conditions
conditions defined by the temperature range between 15 °C and 35 °C at a relative air humidity between 30 % and 85 %

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 in 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, or 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.