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Third edition
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Optics and photonics — Environmental test methods —

Part 4: Salt mist

Optique et photonique — Méthodes d'essais d'environnement — Partie 4: Brouillard salin

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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).

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).

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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

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The committee responsible for this document is ISO/TC 172, *Optics and photonics*, Subcommittee SC 1, *Fundamental standards*.

ISO 9022-4:2014

This third edition cancels and replaces the second edition (ISO 9022-4:2002), of which it constitutes a minor revision.

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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 pressure, low pressure, immersion*

— *Part 9: Solar radiation*

— *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*

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— *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 and damp heat*

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

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Optics and photonics — Environmental test methods —

Part 4:
Salt mist

1 Scope

This part of ISO 9022 specifies the methods relating to the environmental tests of optical instruments including additional assemblies from other fields (e.g. mechanical, chemical, and electronic devices), under equivalent conditions, for their ability to resist the influence of salt mist.

Exposure to salt mist mainly results in the corrosion of metals. Effects might also occur by way of clogging or binding of moving parts.

The purpose of the testing is to assess, as early as possible, the ability of the instrument, and particularly of the surfaces and protective coatings of the instrument, to resist the effects of a salt atmosphere.

Normally, representative samples or complete small units are used for testing. Complete large instruments or assemblies are only tested as specified in this part of ISO 9022 in exceptional cases.

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2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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ISO 9022-1, *Optics and photonics — Environmental test methods — Part 1: Definitions, extent of testing*

3 General information and test conditions

3.1 Limitations of testing

3.1.1 General

The aim of salt mist testing is unlikely to be achieved, unless the deficiencies and limitations of such testing as detailed in 3.1.2 and 3.1.3 are fully recognized.

3.1.2 Suitability

Salt mist testing is considered suitable for

a) the assessment of the resistance of optical and other functional layers,

b) the assessment of the anti-corrosion effect of metallic and non-metallic coatings, and

c) the early detection of the unacceptability of material combinations.

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3.1.3 Unsuitability

Salt mist tests as specified in this part of ISO 9022 shall not be performed in the following cases:

a) as a general corrosion test, as no verified data are available showing that there is a direct relationship between salt mist corrosion and corrosion caused by other attacking corrosive media or environments;

b) on separate components or assemblies that are used only in assembled configurations or any other configurations protected from corrosion;

c) as a true duplication of natural marine environment.

NOTE Generally, the salt mist test is not reliable for comparing the corrosion resistance of different materials or the anticorrosive effect of coatings exposed to varying climatic conditions, nor is it suitable for predicting the service life of such materials or coatings. Some idea of the service life of different specimens of identical or closely related metals, or of different specimens of identical or comparable protective coating combinations, can be gained by the salt mist test provided that, by correlating field service test data with laboratory tests, such relationships can be demonstrated as exist in the case of aluminium alloys. Such correlation tests are essential if data are required on the accelerating effect (if any) of laboratory testing as compared to performance under natural service conditions.

3.2 Specimens

Specimens shall be made of the basic materials used for the instrument under test; coatings (finishing coatings, protective coatings, thin films on optical parts), if any, shall be of the same structure as those used for the instrument components and surfaces to be assessed.

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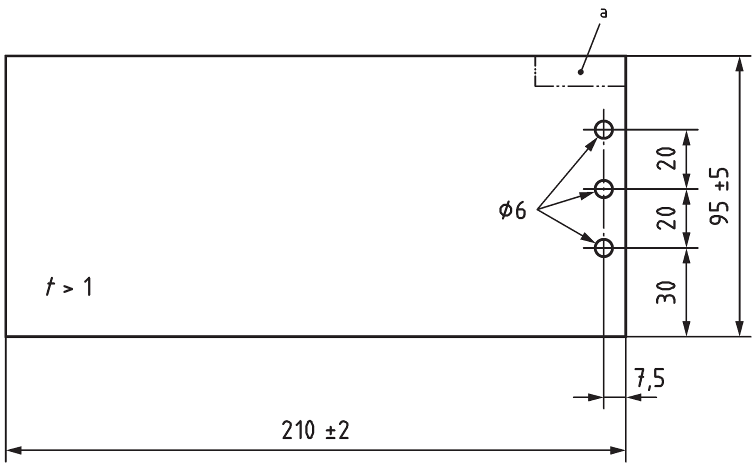
Specimens for testing metallic and non-metallic coatings shall preferably be metal sheets (sample sheets) as shown in Figure 1. The coating under test shall completely cover the sample sheet, especially the outer edges and edges of holes. Where this is not feasible, exposed metal edges shall be protected by a means that does not affect the coating under test. Marking of the sample sheets shall not damage the coating to be tested (e. g. punch-marking shall be carried out prior to applying the coating).

Dimensions in millimetres



a Marking area (on the back).

Figure 1 — Sample sheet

Where the instruments or instrument components to be assessed are made of cast material, the use of specimens originating from the same batch shall be agreed upon and documented in the test report.

In the test of optical and other functional layers, specimens shall be used as test-pieces which consist of the same basic materials as the original components.

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Complete large instruments and assemblies, or separate components that are used in assembled configurations only, shall not be tested in accordance with this part of ISO 9022, unless as an exception. If necessary, essential areas of such specimens and of specimens other than sample sheets (e. g. electrically insulated components, open assemblies) may be used for assessment by agreement between the parties concerned.

3.3 Apparatus (see Figure 2)

The test apparatus essentially comprises of the components described below. All parts of the test apparatus that come into contact with the salt mist or the test solution shall be made of a material that will not affect the corrosiveness of the test solution or the salt mist.

3.3.1 Test chamber, used for salt mist tests including a heated exposure chamber providing pressure balance and measuring/controlling means to adjust and maintain the test temperature to 35 °C ± 2 °C within the closed chamber. The test chamber shall have a volume of not less than 400 l; it shall be constructed so as to prevent condensate dripping from overhead and from the sidewalls onto the specimens. The dripping of condensate from overhead can be avoided by inclining the exposure chamber at least 30° to the horizontal.

Test solution, once atomized, shall not return into the salt solution reservoir.

The exposure zone is that part of the test chamber which is not covered by the cone-shaped spray, and where uniform distribution of the mist can be demonstrated in accordance with 3.5.2.

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3.3.2 Atomizing nozzles, made of polymethylmethacrylate or polyvinylchloride and having an opening of 1 mm in diameter. Their dispersion angle is approximately 30° and they are operated at a positive pressure of between 70 kPa and 140 kPa, and a suction level of 200 mm to 500 mm. Salt mist has been proven to be best produced by self-priming compressed air nozzles without a regulating or quick-cleaning needle. It is useful to provide a means for measuring and controlling the flow of fluid (see Figure 2); serving to adjust and control the amount of salt solution to be atomized so that the condensate collected per hour in the exposure chamber is kept within the acceptable tolerances specified in 3.5.2.

The spray shall not impinge upon the specimens. It may therefore be necessary to direct the spray against one of the chamber walls (see Figure 2, example 2) or, if the nozzle is installed at the bottom of the chamber, to provide a guide tube (see Figure 2, example 1).

The number and location of the atomizing nozzles shall be selected so that the requirements for the available exposure space as specified in 3.5.2 are met.

Other types of nozzles may be used provided that the materials of which they are made of do not affect the corrosiveness of the salt mist and that the salt mist produced by such nozzles meets the requirements specified in 3.5.2.

3.3.3 Levelling receptacle and supply line, for the salt solution to be atomized, designated, and constructed so that the suction level remains constant throughout the duration of the test.

3.3.4 Airline including oil and solid matter trap, and humidifier, designed and constructed so that the compressed air remains saturated with water at the required temperature throughout the duration of the test. A pressure gauge for measuring the air pressure at the nozzle shall be installed in the airline running from the humidifier to the exposure chamber.

3.3.5 Racks, permitting the arrangement of the specimens within the available exposure space so that they do not come into contact with each other.

Major surfaces of representative samples and, if possible, of assemblies shall be inclined at least 60° to the horizontal.

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