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Optics and photonics — Environmental test methods —

Part 12: Contamination

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

Partie 12: Contamination

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Contents

Page

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 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 second edition cancels and replaces the first edition (ISO 9022-12:1994), of which it constitutes a minor revision.

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 and 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 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.

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

Optics and photonics — Environmental test methods —

Part 12: Contamination

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 contamination, i.e. contact with corrosive chemical substances (hereafter called test agents).[1)]

However, complete instruments or assemblies are only tested as specified in this part of ISO 9022 in exceptional cases (see 5.3). Normally, representative samples such as material items or surface coatings on representative substrates are used for testing.

The tests described in this part of ISO 9022 are designed for the selection of materials and components for instruments likely to suffer contamination during service life, rather than for regular production control.

The purpose of testing is to investigate the resistance of an instrument and, in particular, of instrument surfaces, coatings, or synthetic materials, to a short exposure to the test agents.

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.

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

3 General information and test conditions

The test shall be conducted under ambient atmospheric conditions in accordance with ISO 9022-1.

The test agents listed from each conditioning method (Clause 4) represent different chemical groups.

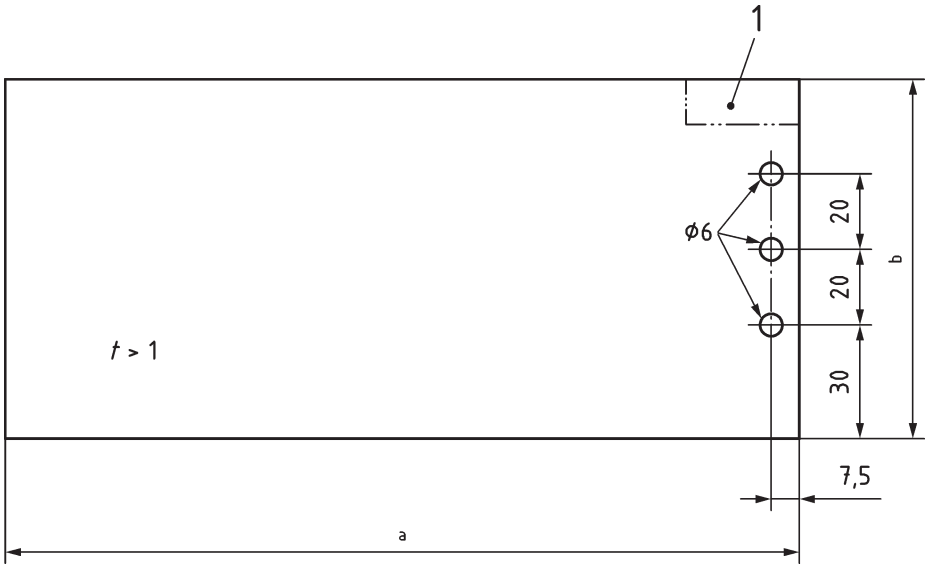
3.1 Specimen

Unless the testing of complete instruments or assemblies is required in the relevant specification, representative samples shall be used for testing. Representative sample sheets of at least 1 mm thickness and having dimensions as shown in Figure 1 shall be used as substrates for the testing of non-metallic coatings.

NOTE Sample sheets of 140 mm ± 2 mm or 280 mm ± 2 mm in length can also be specified in the relevant specification.

1) Another possible source of service contamination to which optical instruments can be exposed is radioactive elements and isotopes, and hazardous chemical substances (e.g. 2:2-dichlorodiethysulfide). However, as these materials may only be handled, used for testing, and stored by special, officially approved laboratories, they were not used as test reagents.

Dimensions in millimetres



Key

1 marking area (on the back)

a 210 ± 2 (280 ± 2)

b 95 ± 5 (140 ± 2)

Figure 1 — Sample sheet

Coatings to be tested shall be of the same structure as the coating intended for the instrument or for parts of the instrument.

Prior to applying the coating, prepare the surface of the sample sheet in the same manner as required for the original instrument. The coating shall completely surround the sample sheet so as to cover, particularly, edges, corners, and edges of holes. The coating shall not be degraded by identification marking; numbers, etc. shall be punched prior to applying the coating.

Particular care shall be taken to apply the coating in such a manner that the dry film will meet the thickness required for the instrument with a tolerance of ± 5 µm. The specimens shall be protected from contamination until commencement of the tests.

If sample sheets as shown in Figure 1 are not available, as level a surface as possible of representative instrument parts shall be used as test areas for testing synthetic materials. Where such surfaces are not sufficient in size to support the test pad (3.2), the specimen shall be half immersed in the test agent in order to permit testing under the required conditions.

3.2 Test pad

Felt pads having the following characteristics and drenched with test agent shall be used as test media:

colour: white

mass density: 0,25 g/cm^3 to 0,30 g/cm^3

pH: 5 to 8 (for measurement, see Annex A)

thickness: 1 mm

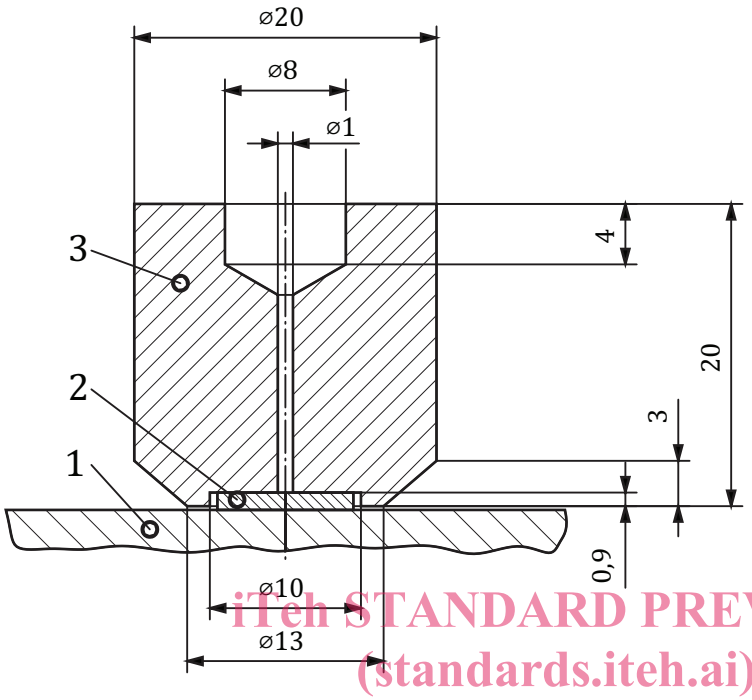
diameter 9 mm

The felt pads shall be used only once.

3.3 Test weight and arrangement of test pads

For the duration of the test, the felt pad, drenched in test agent, shall be weighted by means of a high-grade steel (e.g. X 5 CrNi 18 9 or X 5 CeNi 18 10) weight as shown in Figure 2.

Dimensions in millimetres



Tolerances

Dimension	Tolerance
0,5 to 6	± 0,1
> 6 to 30	± 0,2
> 30 to 120	± 0,3

Key

1 specimen
2 drenched felt pad
3 weight approx. 43 g

Figure 2 — Weight and test arrangement

Where corrosive agents (such as concentrated acids or acids developing corrosive vapour) capable of attacking the weight are used for testing, the test pad shall be covered with a polytetrafluoroethylene (PTFE) capsule as shown in Figure 3 before placing the weight on it.

Normally, up to 21 test pads can be placed on a specimen with dimensions as shown in Figure 1, provided that the pads are arranged in seven lines of three exposure areas each. Care shall however be taken to leave sufficient space between the exposure areas to prevent mutual contamination of the test agents. Each exposure area shall be appropriately identified by means of a pressure-sensitive label showing the test agent used and the degree of severity. Direct lettering in pencil or by similar means is unacceptable.