INTERNATIONAL STANDARD

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Optics and photonics — Environmental test methods —

Part 6: Dust

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

Partie 6: Poussière

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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).

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 9022-6:1994), 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 6: Dust

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 blowing dust.

The purpose of testing is to investigate to what extent the optical, climatic, mechanical, chemical, and electrical (including electrostatic) performance characteristics of the specimen are affected by blowing dust, especially with a view to malfunctions of moving parts (such as sliding surfaces, bearings, contacts, operating controls, gears) or unacceptable wear of surfaces.

This test is not intended to determine the wear resistance to coarse dust.

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 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

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

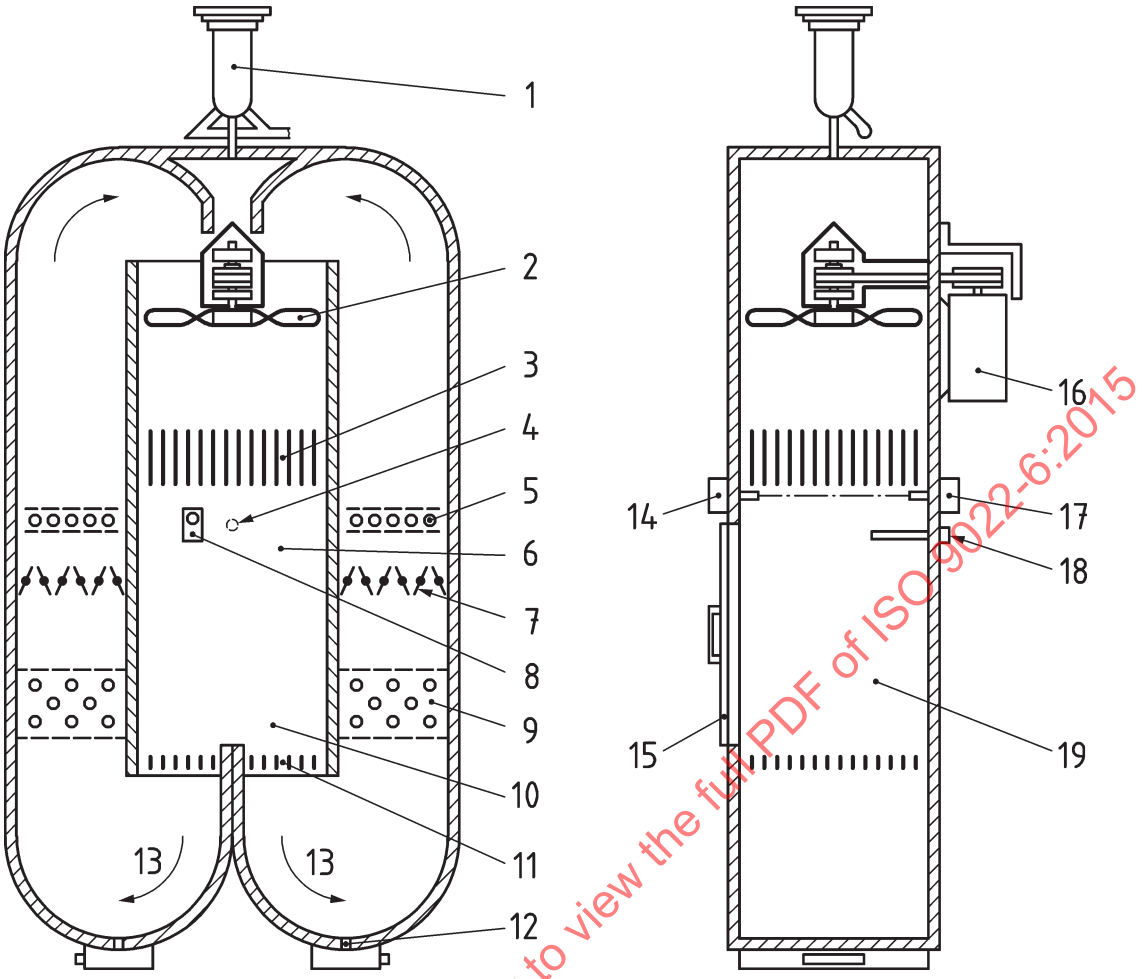
3 General information and test conditions

During exposure, optical surfaces shall be protected from dust by any means of covering, such as dust caps. The type of covering to be used shall be specified in the relevant specification. If the specimen is to be exposed without the optical surfaces being covered, this shall be stated in the relevant specification.

The test chamber shall be sufficiently large to ensure that the specimen occupies no more than 50 % of the cross-sectional area (normal to the air flow) and 50 % of the useful volume of the test chamber.

Figure 1 shows an example of a test chamber configuration.

The mineral dust shall consist of sharp-edged particles not less than 97 % (m/m) silicon dioxide (SiO_2). The particle size distribution and the wire mesh sieve required for the analysis shall be in accordance with Table 1.



Key

1	dust feeder, including metering and dehumidifying devices	11	floor grating
2	fan	12	dust evacuation
3	flow straighteners	13	feedback
4	temperature sensor	14	photoelectric dust concentration meter
5	heating element	15	test chamber door
6	hygrometer	16	fan motor
7	air velocity controlling throttles	17	standard light source
8	photoelectric dust concentration meter	18	temperature sensor
9	dehumidification (cooling)	19	test chamber
10	test chamber		

Figure 1 — Example of test apparatus configuration (schematic view)

Each exposure shall be run with fresh dust. The specimen shall be placed as near to the centre of the test chamber as possible. In the event that more than one specimen is to be tested simultaneously, they shall be arranged at right angles to the air flow at a distance of not less than 100 mm from each other and from the test chamber walls. The specimen shall be positioned in such a way that the most vulnerable surfaces face the blowing dust. The position of the specimen may be reoriented during exposure in order to expose different surfaces to the air flow. The position and number of surfaces to be exposed to the air flow shall be specified in the relevant specification. Allot equal portions of the exposure period to each surface to be exposed.

Table 1 — Dust particle size distribution and wire mesh sieves

Fine dust particle size distribution % (m/m) ±2 %	Particle size mm		Test sieve in accordance with ISO 565 µm
	from	to	
2	0,1	0,14	140
8	0,071	0,1	100
15	0,045	0,071	71
75	<0,045		45

4 Conditioning method 52: Blowing dust

See Table 2.

Table 2 — Degrees of severity for conditioning method 52: Blowing dust

Step	Parameter	Unit	Degree of severity		
			01	02[a]	03[b]
1	Temperature	°C	18 to 28	18 to 28	18 to 28
	Relative humidity	%	<25	<25	<25
	Air velocity	m/s	8 to 10	8 to 10	8 to 10
	Sand concentration	g/m³	5 to 15	5 to 15	5 to 15
	Exposure time	h	6	6	6
2[c]	Temperature	°C	Not applicable	Not applicable	55 to 65
	Relative humidity	%			<25
	Air velocity	m/s			1 to 3
	Exposure time	h			16
3	Temperature	°C	Not applicable	35 to 45	55 to 65
	Relative humidity	%		<25	<25
	Air velocity	m/s		8 to 10	8 to 10
	Sand concentration	g/m³		5 to 15	5 to 15
	Exposure time	h		6	6
State of operation			1 or 2		

a Steps 1 and 3 shall follow one another immediately.

b Steps 1 to 3 shall follow one another immediately.

c Sand feed discontinued.

5 Procedure

5.1 General

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

5.2 Preconditioning

In the absence of provisions in the relevant specification for preconditioning, the specimen shall be clean and dry.