IEC 61300-2-21

Edition 2.0 2009-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –
Part 2-21: Tests – Composite temperature/humidity cyclic test

Dispositifs d'interconnexion et composants passifs à fibres optiques – Méthodes fondamentales d'essais et de mesures –
Partie 2-21: Essais – Essai cyclique composite de température et d'humidité

IEC 61300-2-21:2009

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX

M

ICS 33.180.20

ISBN 978-2-88912-049-9

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 2-21: Tests – Composite temperature/humidity cyclic test

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International Standard IEC 61300-2-21 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This bilingual version (2010-07) replaces the English version.

This second edition cancels and replaces the first edition published in 1995. It constitutes a technical revision. The changes with respect to the previous edition are:

– to reconsider the whole parts of the standard;
– to describe the apparatus and procedure in greater details;
– to define with precision the number of 24 cycles in the severity.

The text of this standard is based on the following documents:

FDIS	Report on voting
86B/2924/FDIS	86B/2961/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts of IEC 61300 series, under the general title, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures,* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,
- replaced by a revised edition, or
- amended.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 2-21: Tests – Composite temperature/humidity cyclic test

1 Scope

The purpose of this part of IEC 61300 is to determine the resistance of a fibre optic device to the deteriorative effects of high temperature, humidity and cold conditions.

It is intended to reveal defects in a device under test (DUT) caused by breathing as opposed to absorption of moisture. The test covers the effect of the freezing of trapped water in cracks and fissures as well as condensation. However, the degree of condensation will vary depending on the size and thermal mass of the DUT.

This test differs from other cyclic damp heat tests in that it derives its increased severity from:

a) a greater number of temperature variations leading to pumping actions in a given time;
b) a greater cyclic temperature range;
c) a higher rate of change of temperature;
d) the inclusion of a number of excursions to sub-zero temperature.

This type of test is particularly important for fibre optic devices made of a variety of different materials.

2 Normative references

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

IEC 60068-2-38, *Environmental testing – Part 2-38: Tests – Test Z/AD: Composite temperature/humidity cyclic test*

IEC 61300-3-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-1: Examinations and measurements – Visual examination*

IEC 61300-3-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-4: Examinations and measurements – Attenuation*

3 General description

This procedure is conducted in accordance with IEC 60068-2-38, test Z/AD. The DUT is placed in a humidity chamber and subjected to 10 temperature-humidity cycles, each of 24 h duration. During any five of the first nine cycles after exposure to the humidity subcycle, the DUT shall be subjected to cold.

4 Apparatus

4.1 General

The exposure to moisture, followed by cold, can either be performed in one chamber or in two separate chambers.

4.2 Chamber for the exposure to moisture

The chamber for the exposure to moisture shall be so constructed that:

a) The temperature can be varied between 25 °C ± 2 °C and 65 °C ± 2 °C in a period of between 1 h 30 and 2 h 30 for both rising and falling temperatures.

b) The relative humidity can be maintained at 93 % RH ± 3 % RH during the periods of constant or rising temperature and between 88 % RH ± 8 % RH during the falling temperature periods.

c) Care shall be taken to ensure that the conditions prevailing at any point in the working space are uniform and are as similar as possible to those prevailing in the immediate vicinity of suitably located temperature and humidity sensing devices.

   The air in the chamber shall be continuously stirred at a rate necessary to maintain the specified conditions of temperature and humidity.

d) The DUT shall not be subjected to radiant heat from the chamber conditioning processes.

e) Condensed water is continuously drained from the chamber and not used again until it has been repurified.

f) Precautions shall be taken to ensure that no condensed water from the walls and roof of the test chamber can fall on the DUT.

4.3 Chamber for exposure to cold

The chamber for exposure to cold shall be so constructed that:

a) The temperature can be maintained at –10 °C ± 2 °C.

b) Care shall be taken to ensure that the conditions prevailing at any point in the working space are uniform and are as similar as possible to those prevailing in the immediate vicinity of suitably located temperature-sensing devices.

   The air in the chamber shall be continuously stirred.

c) Care shall be taken that the thermal capacity of the DUT does not appreciably influence conditions within the chamber.

4.4 Humidity chamber

The humidity chamber may be used for exposure to cold in which case it shall meet the requirements of 4.2 and in addition shall be so constructed that:

a) The temperature can be lowered from 25 °C ± 2 °C to –10 °C ± 2 °C in a period of not more than 30 min.

b) The DUT can be held at a temperature of –10 °C ± 2 °C for a period of 3 h.

c) The temperature can be raised from –10 °C ± 2 °C to 25 °C ± 2 °C in a period of not more than 90 min.

4.5 Optical source and detector

The optical source and detector used to measure changes in attenuation shall comply with those specified in IEC 61300-3-4.

5 Procedure

5.1 Preparation of specimens

Prepare the specimen according to the manufacturer's instructions or as specified in the relevant specification. The specimen shall be terminated with a sufficient length of fibre cable to facilitate connection with the optical source and the detector.

Clean the optical and mechanical parts of the DUT according to the manufacturer's instructions.

5.2 Pre-conditioning (see Figure 1)

Unless otherwise specified, the DUT, switched off, ready for-use-state, shall be subjected to 55 °C ± 2 °C with a relative humidity not exceeding 20 % RH for a period of 24 h prior to the conditioning.

The DUT shall then be allowed to attain thermal stability at standard atmospheric conditions for testing or as otherwise specified before the initial measurements are made.

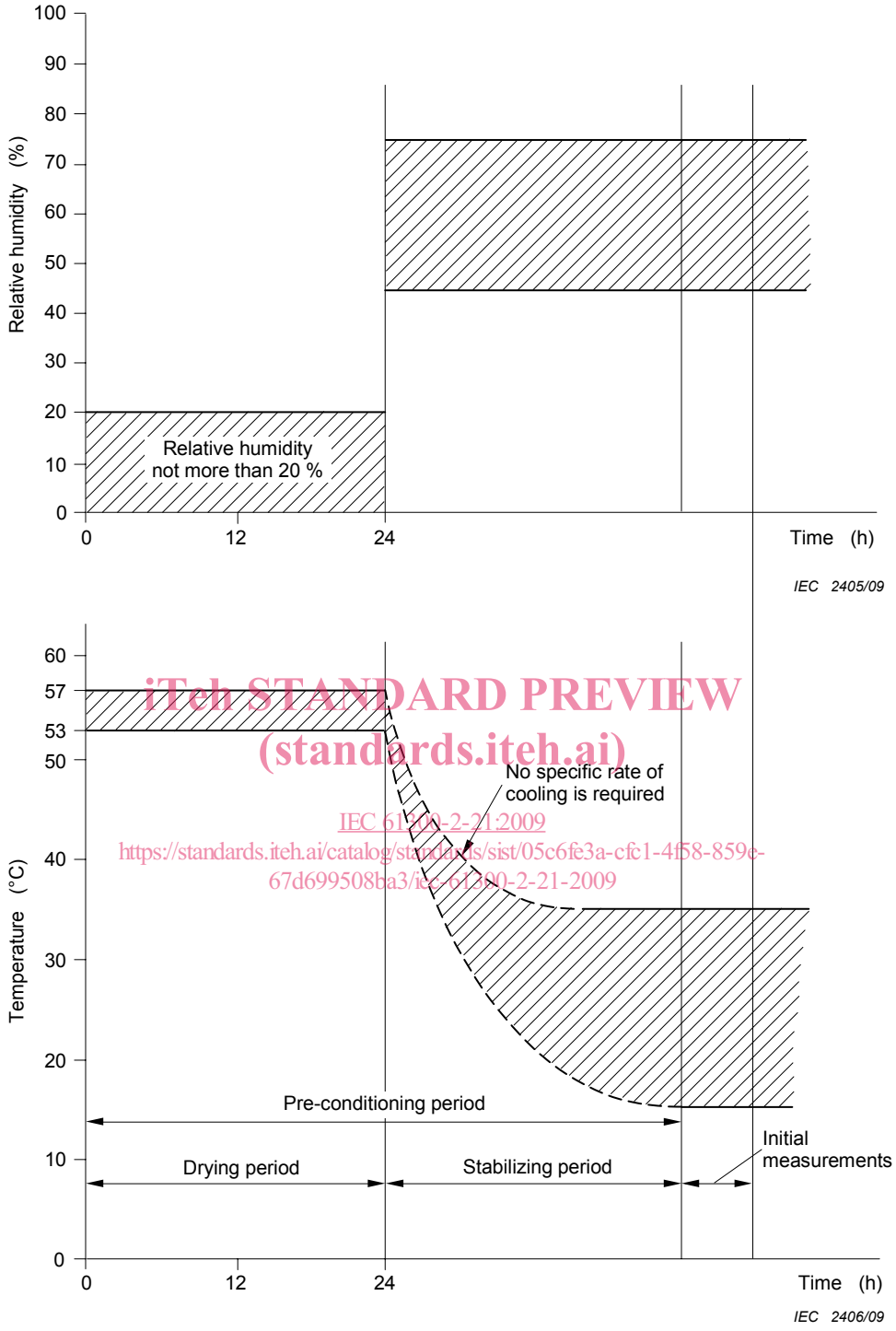

Figure 1 – Preconditioning

5.3 Initial measurements

The DUT shall be visually inspected and optically measured and mechanically checked as required by the relevant specification.

5.4 Conditioning

5.4.1 General

The DUT shall be introduced into the humidity chamber, switched off, ready-for-use state, and mounted in the normal orientation, if this is known, or as otherwise specified and shall be subjected to 10 temperature/humidity cycles, each of 24 h duration.

During any five of the first nine of the above cycles after exposure to the humidity subcycle (a-f in Figure 2), the DUT shall be subjected to cold.

This exposure may be performed either in the same chamber or in separate chambers. If separate chambers are used for the high-temperature/high-humidity and low-temperature sub-cycles of the test, the DUT should not be subjected to thermal shock conditions unless it is known that they are insensitive to this degree of thermal shock.

If a batch of DUT is subjected to thermal shock through the use of the two chamber methods and significant failures occur, a further batch shall be retested with gradual change of temperatures and shall be considered to have passed the test successfully if no significant failures occur under these conditions.

The remaining four of the first nine cycles shall be run without exposure to cold (see 5.4.2.1.).

The humidity cycles prescribed are the same in all cases.

5.4.2 Description of 24 h cycle

5.4.2.1 Description of temperature/humidity subcycle (applicable to all cycles, see Figure 2)

At “zero time” of every 24 h cycle, the chamber condition shall be controlled to a temperature of 25 °C ± 2 °C and relative humidity of 93 % RH ± 3 % RH.

a) The temperature of the chamber shall be steadily raised to 65 °C ± 2 °C over a period of 2 h ± 30 min. During this period, the relative humidity shall be maintained at 93 % RH ± 3 % RH.

b) The temperature and relative humidity in the chamber shall be maintained at 65 °C ± 2 °C and 93 % RH ± 3 % RH respectively until 5 h 30 after the start of the cycle.

c) The temperature shall then be allowed to fall to 25 °C ± 2 °C over a period of 2 h ± 30 min . During this period, the relative humidity shall be maintained at 88 % RH ± 8 % RH.

d) Beginning 8 h after the start of the cycle, the temperature shall again be steadily raised to 65 °C ± 2 °C over a period of 2 h ± 30 min. During this period, the relative humidity shall be maintained at 93 % RH ± 3 % RH.

e) The temperature and relative humidity in the chamber shall be maintained at 65 °C ± 2 °C and 93 % RH ± 3 % RH respectively until 13 h 30 after the start of the cycle.

f) The temperature shall then be allowed to fall to 25 °C ± 2 °C over a period of 2 h ± 30 min. During this period, the relative humidity in the chamber shall be maintained at 88 % RH ± 8 % RH.

g) The chamber shall then continue to run at a stabilised temperature of 25 °C ± 2 °C and relative humidity of 93 % RH ± 3 % RH until the start of the cold subcycle or until the end of the 24 h cycle as appropriate.

5.4.2.2 Description of cold subcycle

Applicable to any five of the first nine cycles (see Figure 2).

a) Following the completion of the temperature/humidity subcycle (a-f in Figure 2), the chamber is maintained at a temperature of 25 °C ± 2 °C and relative humidity of 93 % RH ± 3 % RH for a period of at least one but not more than 2 h.

b) 17 h 30 after the start of the cycle, the DUT shall be exposed to a temperature of –10 °C ± 2 °C. The ambient temperature of the chamber shall be reduced over a period of not more than 30 min.

c) Beginning 18 h after the start of the cycle, the temperature shall be maintained at −10 °C ± 2 °C for a period of 3 h.

   No requirement for humidity is prescribed during the entire cold subcycle.

d) Beginning 21 h after the start of the cycle, the temperature shall be raised to 25 °C ± 2 °C. This temperature shall be reached 22 h 30 after the start of the cycle (see Figure 2).

   If the DUT is transferred from one chamber to another, the transfer shall be completed within a period of 10 min to 15 min.

e) The temperature of the chamber shall be maintained at 25 °C ± 2 °C until the 24 h cycle is completed.

   During this period, the relative humidity shall be 93 % RH ± 3 % RH.

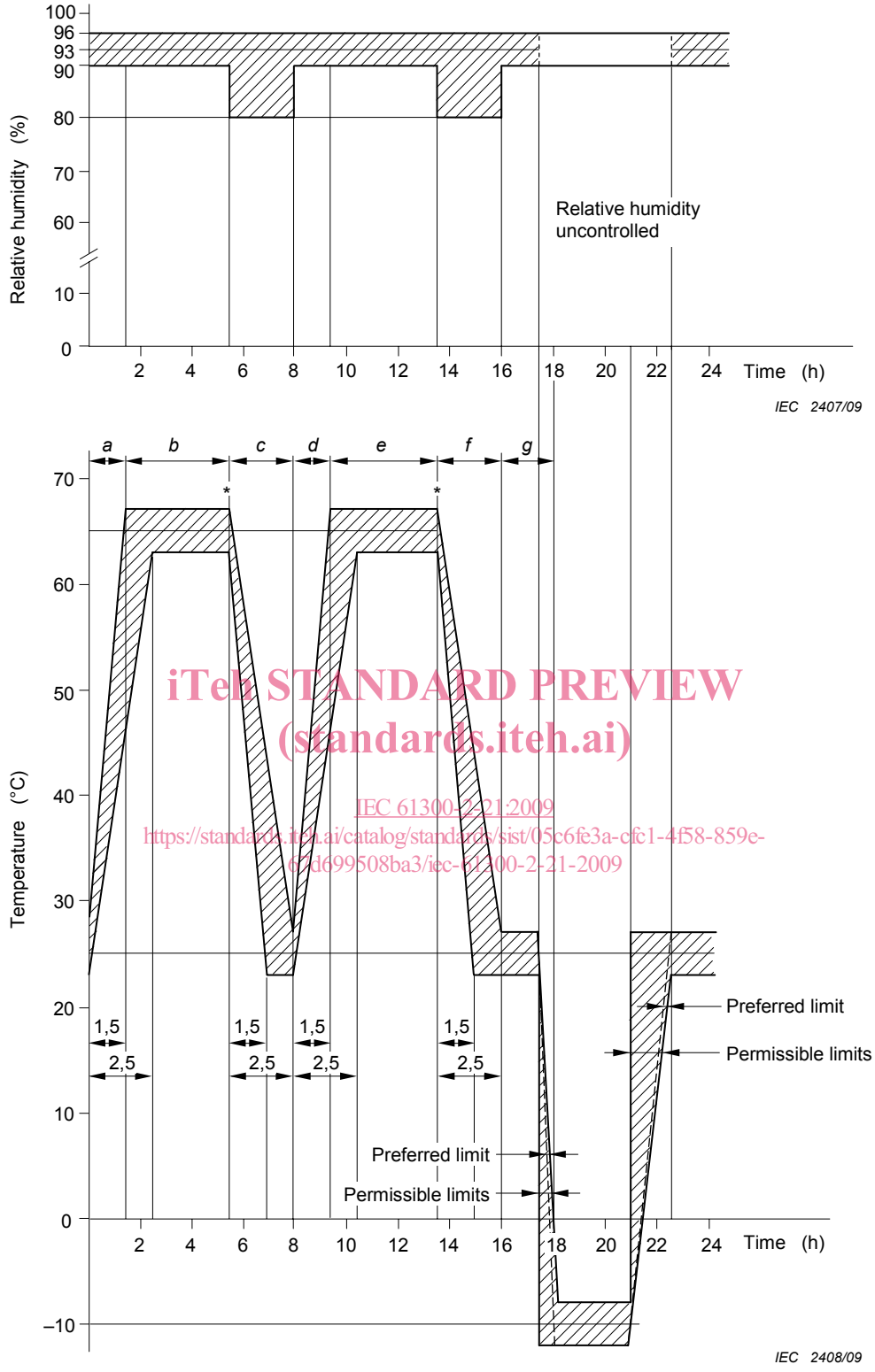

Figure 2 – Exposure humidity followed by exposure to cold