IEC 61300-2-48

Edition 2.0 2009-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –
Part 2-48: Tests – Temperature-humidity cycling

Dispositifs d'interconnexion et composants passifs à fibres optiques – Méthodes fondamentales d'essais et de mesures –
Partie 2-48: Essais – Cycles d'humidité et de température

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CONTENTS

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

Part 2-48: Tests – Temperature-humidity cycling

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International Standard IEC 61300-2-48 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This second edition of IEC 61300-2-48 cancels and replaces the first edition published in 2003 and constitutes a technical revision. The main changes are the addition of the Category O cycle procedure and the severity reconsideration.

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

FDIS	Report on voting
86B/2807/FDIS	86B/2829/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.

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

A list of all parts of the IEC 61300 series, published 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 maintenance result 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

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- withdrawn,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

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

Part 2-48: Tests – Temperature-humidity cycling

1 Scope

This part of IEC 61300 details a procedure for determining the suitability of a fibre optic device or closure to withstand variations in humidity and temperature that may occur during operation, storage and/or transport. The test is intended to indicate the performance of such devices when exposed to heat and humidity followed by short-term freezing.

In general terms, this test provides a high temperature to induce potential failures due to softening and expansion, a high humidity to encourage moisture absorption and swelling and a low temperature to facilitate ice formation, embrittlement and contraction.

This test differs from other cyclic environmental tests, notably the damp heat cyclic test of IEC 61300-2-46 and the composite temperature-humidity cyclic test of 61300-2-21, by incorporating alternative levels of severity. This is achieved through

a) a greater number of cycles;

b) a greater cyclic temperature range;

c) a decreased cyclic period.

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 61300-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 1: General and guidance*

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

The specimen is placed in an environmental chamber and subjected to a number of temperature-humidity cycles, as defined in the relevant specification. The attenuation of the specimen is monitored throughout the duration of the test.

4 Apparatus

4.1 Chamber

The apparatus shall consist of an environmental chamber capable of maintaining the temperature and humidity requirements within the specified tolerances.

The chamber shall be constructed so that

– it is capable of housing the specimen;
– it allows access for measurement;
– it is capable of maintaining homogeneous conditions;
– it uses distilled, demineralized or deionized water to achieve the required humidity conditions;
– no rust or corrosion contaminants are imposed on the specimen;
– no condensed water can fall on the specimen;
– the conditions experienced by the specimen and the temperature- and humidity-sensing devices are as similar as possible.

4.2 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.

NOTE A device to record attenuation over time (X, t) should be used where the optical detector does not have the capability to monitor continuously.

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 detector.

5.2 Preconditioning

Place the specimen in the chamber and precondition for 2 h at the standard test conditions, as defined in IEC 61300-1 unless otherwise specified in the relevant specification.

5.3 Initial examinations and measurements

Complete initial examinations and measurements on the specimen as required by the relevant specification.

5.4 Conditioning

Set the chamber temperature and humidity profile to achieve the specified severities.

5.4.1 Method A

For Category O, it is necessary to move to transition rapidly from the low temperature to the high temperature without a dwell at 23 °C. In this case, make the temperature changing according to the following cycle:

The specimen shall be subjected to a temperature cycle from T_{max} °C ± 2 °C to T_{min} °C ± 2 °C for a total of 14 cycles, where T_{max} and T_{min} are defined by the relevant specification.

Examples of T_{max} and T_{min} are shown in Table 1. Temperature change from 23 °C to T_{min} and T_{min} to 23 °C shall occur in 1 h. Temperature change from T_{min} to T_{max} and T_{max} to T_{min} must occur faster (20 min max.) to maximize condensation. Dwell times for this test shall be a minimum of 2 h.

NOTE Dwells occur at T_{max}, 23 °C and T_{min} °C.

The humidity shall be controlled from T_{min} to T_{max} as follows:

– at 23 °C maintain a constant relative humidity of 95 %;
– between 23 °C and T_{max} relative humidity is uncontrolled;
– at T_{max} maintain a constant relative humidity of 95 %;
– between T_{max} and T_{min} relative humidity is uncontrolled;
– at T_{min} the humidity is uncontrolled. However, water vapour should not be evacuated from the environmental chamber. This is to allow condensation and the formation of ice to occur.

A schematic showing of an example of the temperature-humidity profile for T_{max} = 65 °C and T_{min} = −10 °C is shown in Figure 1.

NOTE The tolerance on relative humidity values is ±5 %. This means that the actual operating humidity may be up to 100 % RH, for short term operation, however a 95 % RH upper limit has been specified for practical measurement purposes.

Attenuation measurements shall be made throughout the duration of the test. The attenuation measurements shall be within the specified limits defined in the relevant specification.

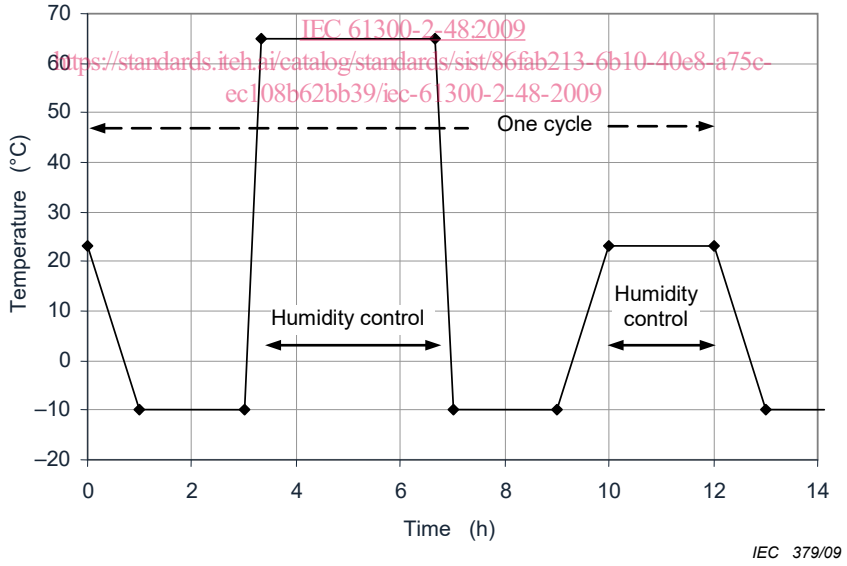

Figure 1 –Temperature-humidity profile for T_{max} = 65 °C, T_{min} = −10 °C

5.4.2 Method B

The specimen shall be subjected to a temperature cycle from T_{max} °C ± 2 °C to –40 °C ± 2 °C for a total of 42 cycles, where T_{max} is the upper temperature limit, defined by the relevant specification. (Examples of T_{max} are shown in Table 1). The rate of temperature change shall be ≥1 °C per minute and dwell times for this test shall be a minimum of 1 h.

NOTE Dwells occur at T_{max}, 23 °C and –40 °C.

The humidity shall be controlled from 10 °C to T_{max} as follows:

– at 23 °C maintain a constant relative humidity of 85 %;
– between 23 °C and T_{max} maintain a nominal linear change in relative humidity;
– at T_{max} maintain a constant relative humidity of 20 %;
– between 10 °C and 23 °C maintain a relative humidity of 85 %;
– below 10 °C the humidity is uncontrolled. However, water vapour should not be evacuated from the environmental chamber. This is to allow condensation and the formation of ice to occur.

A schematic showing an example of the temperature-humidity profile for T_{max} = 85 °C is shown in Figure 2.

NOTE The tolerance on relative humidity values is ±5 %. This means that the actual operating humidity may be up to 90 % RH, for short term operation; however a 85 % RH upper limit has been specified for practical measurement purposes.

Attenuation measurements shall be made throughout the duration of the test. The attenuation measurements shall be within the specified limits defined in the relevant specification.

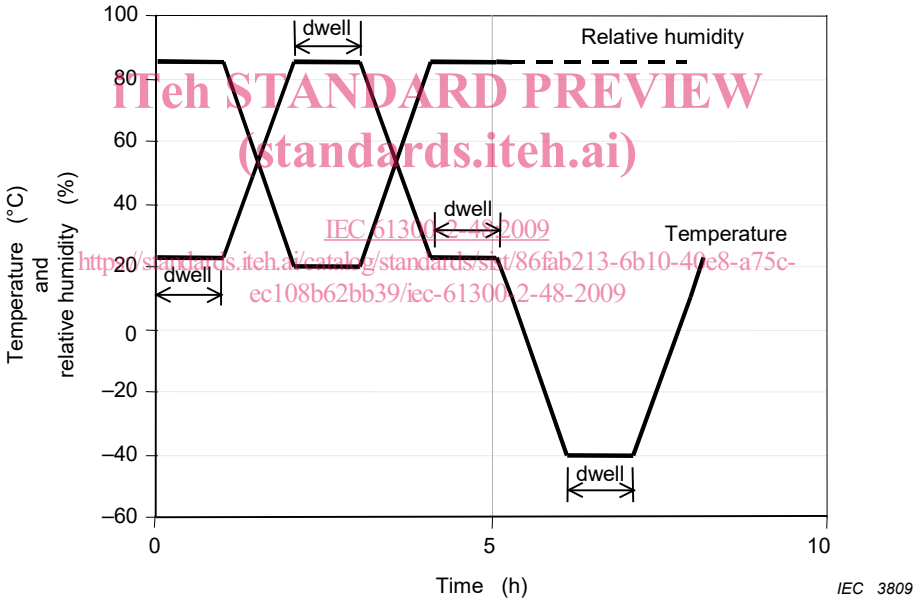

Figure 2 – Temperature-humidity profile for T_{max} = 85 °C

5.5 Recovery

Allow the specimen to remain under standard test conditions for 2 h, as defined in IEC 61300-1, unless otherwise specified in the relevant specification. Clean the specimen according to the manufacturer's instructions.

5.6 Final examinations and measurements

On completion of the test, remove all fixtures and make final measurements, as defined by the relevant specification, to ensure that there is no permanent damage to the specimen. The results of the final measurement shall be within the limit established in the relevant specification.

Unless otherwise specified, visually examine the specimen in accordance with IEC 61300-3-1. Check for evidence of any degradation in the specimen. This may include, for example

– broken, loose or damaged parts or accessories;
– breaking or damage to the cable jacket, seals, strain relief, or fibres;
– displaced, bent, or broken parts.

6 Severity

Severity is a function of the temperature, humidity and number of cycles to which the test samples are exposed. Table 1 shows recommended severities for the temperature-humidity cycling test.

Table 1 – Test severities

Temperature range °C	Humidity range % RH	Number of cycles
–10 to +65	90 to 100	14
–40 to +75	80 to 90	42
–40 to +85	80 to 90	42

7 Details to be specified

The following details, as applicable, shall be specified in the relevant specification:

– temperature range;
– humidity range;
– number of cycles;
– DUT orientation;
– initial examinations, measurements and performance requirements;
– change of attenuation allowed during test;
– final examinations, measurements and performance requirements;
– deviations from test procedure;
– additional pass/fail criteria.