

BS EN 61300-2-48: 2009



# BSI British Standards

## **Fibre optic interconnecting devices and passive components — Basic test and measurement procedures —**

Part 2-48: Tests — Temperature-humidity cycling

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### National foreword

This British Standard is the UK implementation of EN 61300-2-48:2009. It is identical to IEC 61300-2-48:2009. It supersedes BS EN 61300-2-48:2003 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GEL/86, Fibre optics, to Subcommittee GEL/86/2, Fibre optic interconnecting devices and passive components.

A list of organizations represented on this committee can be obtained on request to its secretary.

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### Amendments issued since publication

Amd. No.	Date	Text affected
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English version

**Fibre optic interconnecting devices and passive components -  
 Basic test and measurement procedures -  
 Part 2-48: Tests -  
 Temperature-humidity cycling  
 (IEC 61300-2-48:2009)**

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  
 (CEI 61300-2-48:2009)

Lichtwellenleiter -  
 Verbindungselemente  
 und passive Bauteile -  
 Grundlegende Prüf- und Messverfahren -  
 Teil 2-48: Prüfungen -  
 Temperatur-Feuchte-Zyklus  
 (IEC 61300-2-48:2009)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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 Comité Européen de Normalisation Electrotechnique  
 Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of document 86B/2807/FDIS, future edition 2 of IEC 61300-2-48, prepared by SC 86B, Fibre optic interconnecting devices and passive components, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61300-2-48 on 2009-04-01.

This European Standard supersedes EN 61300-2-48:2003.

The main changes are the addition of the Category O cycle procedure and the severity reconsideration.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2010-01-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2010-04-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 61300-2-48:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

- |                |      |  |
|----------------|------|--|
| IEC 61300-2-21 | NOTE | Harmonized as EN 61300-2-21:1997 (not modified). |
| IEC 61300-2-46 | NOTE | Harmonized as EN 61300-2-46:2006 (not modified). |

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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61300-1	- <sup>1)</sup>	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 1: General and guidance	EN 61300-1	2003 <sup>2)</sup>
IEC 61300-3-1	- <sup>1)</sup>	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-1: Examinations and measurements - Visual examination	EN 61300-3-1	2005 <sup>2)</sup>
IEC 61300-3-4	- <sup>1)</sup>	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-4: Examinations and measurements - Attenuation	EN 61300-3-4	2001 <sup>2)</sup>

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<sup>1)</sup> Undated reference.

<sup>2)</sup> Valid edition at date of issue.

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# 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  $\pm$  2 °C to  $T_{\min}$  °C  $\pm$  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  $\pm 5$  %. 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.

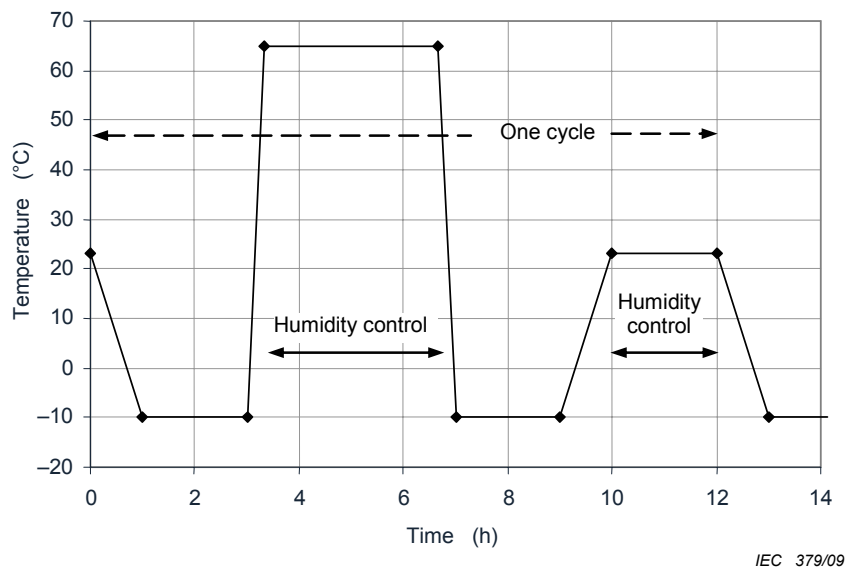


Figure 1 –Temperature-humidity profile for  $T_{\max} = 65$  °C,  $T_{\min} = -10$  °C

#### 5.4.2 Method B

The specimen shall be subjected to a temperature cycle from  $T_{\max}$  °C  $\pm 2$  °C to  $-40$  °C  $\pm 2$  °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  $\geq 1$  °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  $T_{\max} = 85\text{ °C}$  is shown in Figure 2.

NOTE The tolerance on relative humidity values is  $\pm 5\%$ . 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.

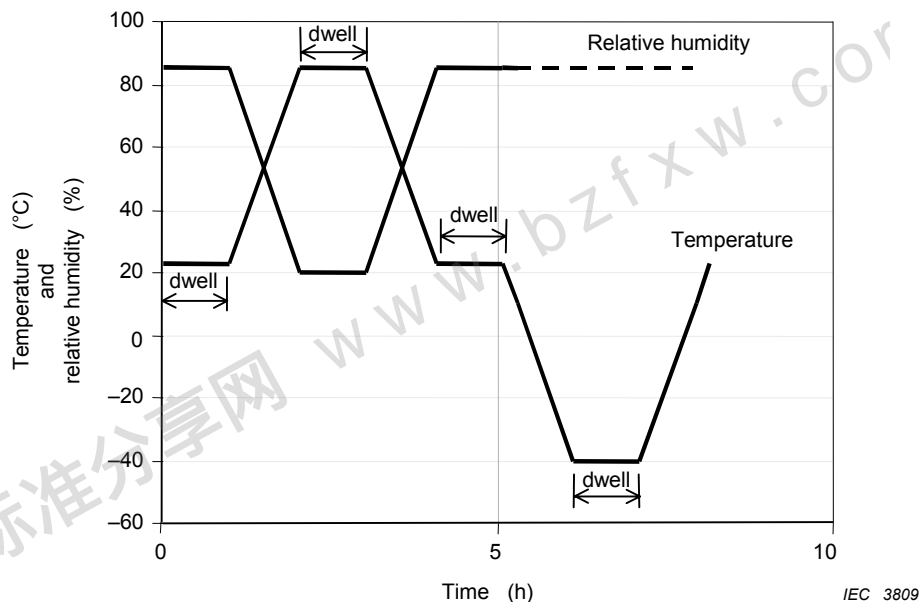


Figure 2 – Temperature-humidity profile for  $T_{\max} = 85\text{ °C}$

### 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.

## Bibliography

IEC 61300-2-21, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-21: Tests – Composite temperature-humidity cyclic test*

IEC 61300-2-46, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-46: Tests – Damp heat cyclic*

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