

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Fibre optic interconnecting devices and passive components –  
Basic test and measurement procedures –  
Part 2-47: Tests – Thermal shocks**

**Dispositifs d'interconnexion et composants passifs à fibres optiques –  
Méthodes fondamentales d'essais et de mesures –  
Partie 2-47: Essais – Chocs thermiques**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

**Part 2-47: Tests – Thermal shocks**

**FOREWORD**

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International Standard IEC 61300-2-47 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition published in 2006. It constitutes a technical revision. The significant changes include the review of the test severity.

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

FDIS	Report on voting
86B/3069/FDIS	86B/3101/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.

The reader's attention is drawn to the fact that Annex A lists an "in some-country" clause on differing practices of a less permanent nature relating to the subject of this standard.

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 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

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- withdrawn,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

The contents of the corrigendum of April 2011 have been included in this copy.

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

## Part 2-47: Tests – Thermal shocks

### 1 Scope

This part of IEC 61300 details a procedure for determining the suitability of a fibre optic device to withstand the effects of thermal shock. In practice this means a very short change over time between extreme temperatures.

### 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 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

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

### 3 General description

This procedure is conducted in accordance with IEC 60068-2-14, test Na. The device under test (DUT) is first subjected to one extreme of temperature for a given period of time. It is then subjected to the other extreme of temperature for an equal period of time.

Two test methods are considered: manual or automatic. Both methods are considered as equivalent. The reference method is the automatic one.

### 4 Apparatus

#### 4.1 Testing chambers

- Two separate chambers or one rapid temperature change rate may be used. If two chambers are used, one for the low temperature and one for the high temperature, they are located such as to allow transfer of the DUT from one chamber to the other within the prescribed time. Either manual and automatic transfer methods may be used.
- The chambers shall be capable of maintaining the atmosphere at the appropriate temperature for the test in any region where the DUT is placed.
- The absolute humidity of the atmosphere inside the chambers should not exceed 20 g/m<sup>3</sup>.

NOTE At the temperature of 60 °C and standard air pressure the relative humidity should be less than 16 %.

- The temperature of the walls of the hot and cold chambers shall not differ by more than 3 % and 8 % respectively from the specified ambient temperature of the test, expressed in Kelvin.
- The volume of the chambers and the air velocity shall be such that after insertion of the DUT, the temperature of the atmosphere shall be within the specified tolerance after a time of not more than 10 % of the exposure time.

- f) The air of the chamber shall be circulated so that the air velocity, measured close to the test specimen, shall be not less than 2 m/s.

#### 4.2 Support for mounting the test specimens

Unless otherwise specified in the relevant specifications, the thermal conductivity of the supports for mounting the specimens shall be low, such that for practical purposes the specimen is thermally isolated. When testing several specimens simultaneously, they shall be so placed that free circulation should be provided between specimens, and between specimens and chamber surfaces.

### 5 Procedure

#### 5.1 General

Conduct the test according to the following procedure.

Unless otherwise stated in the relevant specification, the following applies.

- If the component construction includes optical leads, include 1,5 m of cable in the climatic chamber for each port monitored during the test.
- If optical measurements are requested during the test by the relevant specification, these measurements shall be performed at a maximum interval of 10 min during the extreme temperature periods.
- It is not the intention of the test to record the effects of mechanical movement of the optical cables during the movement of the DUT from one environmental chamber to the other. Therefore the physical arrangement of the cables shall ensure that movement of the DUT does not affect the optical transmission. To verify this, optical cables similar to those attached to the DUT shall be positioned alongside the cables attached to the DUT and monitored throughout the test as a control.

#### 5.2 Preconditioning

Unless otherwise stated in the relevant specification, maintain the DUT under standard atmospheric conditions for a minimum of 2 h. Clean the mechanical and optical alignment parts of the DUT according to the manufacturer's instructions.

#### 5.3 Initial measurements

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

#### 5.4 Testing

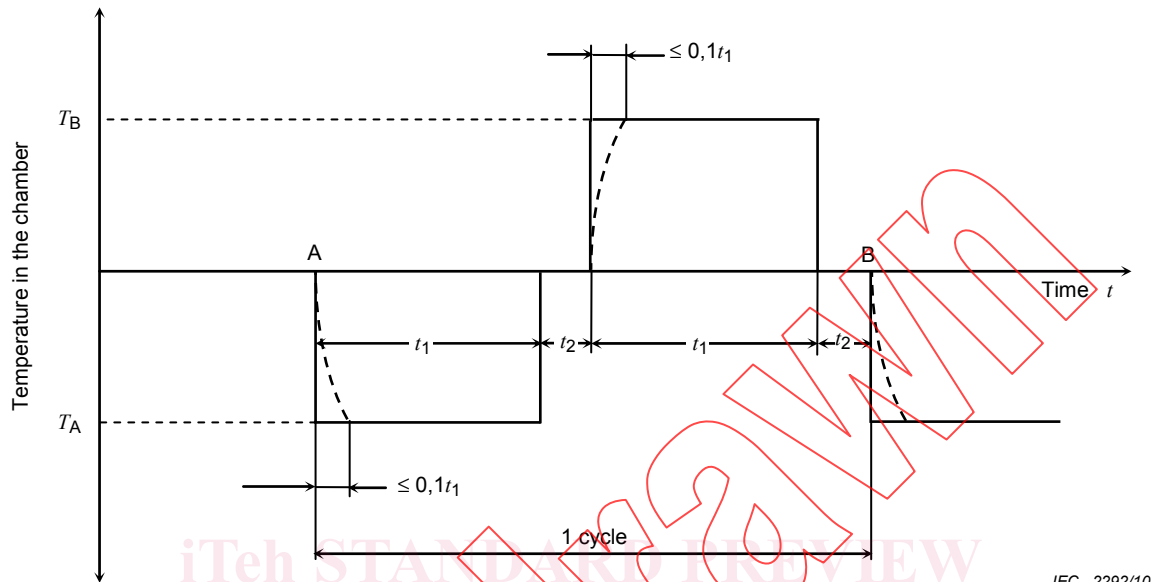
- a) Place the DUT in the chamber in its normal operating position and make connections to the monitoring equipment.
- b) The device shall be subjected to a temperature cycle according to Figure 1.
- c) The DUT shall be placed in the cold chamber, the atmosphere of which has been previously adjusted to the appropriate low temperature  $T_A$ . The atmosphere in the cold chamber shall be maintained at the low temperature  $T_A$  for the appropriate period  $t_1$  ( $t_1$  includes an initial time for temperature stabilization of atmosphere, according to 4.1e).
- d) The DUT shall then be removed from the cold chamber and transferred to the hot chamber in a changeover time  $t_2$  not more than 3 min. In the case of automatic two-chamber test equipment, a changeover period shall be of less than 30 s. The transition time shall include the time of removal from one chamber and the insertion into the second chamber as well as any dwell time at the ambient temperature of the laboratory.
- e) The atmosphere in the hot chamber shall be maintained at the high temperature  $T_B$  for the appropriate period  $t_1$ .



f) For the next cycle the DUT shall be transferred to the cold chamber in a transition time  $t_2$ .

NOTE The exposure time is measured from the moment of insertion of the specimen into the chamber.

The first cycle includes the two exposure times  $t_1$  and the two changeover times  $t_2$  (see Figure 1).



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#### Key

A = start of first cycle

B = end of first cycle and start of second cycle

NOTE The dotted curve is explained in 4.1e).

**Figure 1 – Temperature change cycle**

### 5.5 Recovery

Dry the DUT if necessary and allow it to remain under standard atmospheric conditions for a period of 2 h.

### 5.6 Final measurements

On completion of the test, remove all fixtures. Clean the mechanical and optical alignment parts of the DUT according to the manufacturer's instructions. Take final measurements as required by the relevant specification. If specified, visually examine the specimen in accordance with IEC 61300-3-1 and take any measurements specified to ensure that there is no permanent damage.

## 6 Severity

The severity consists of the combination of the low temperature, high temperature, duration, changeover time and number of cycles.

The following severity shall be used for this procedure:

Conditions:

- Temperature limits:  $\Delta T = 100 \text{ }^\circ\text{C}$  [within operating range of device or  $0 \text{ }^\circ\text{C}$  to  $100 \text{ }^\circ\text{C}$ ]

- Duration at extreme temperature:  $t_1 \geq 30$  min
- Changeover time:
  - manual test:  $t_2 \geq 3$  min
  - automatic test:  $t_2 < 0,5$  min
- Number of cycles: 20

## 7 Details to be specified

The following details shall be specified in the relevant specification:

- manual or automatic test;
- initial examinations, measurements and performance requirements;
- examinations, measurements during test and performance requirements;
- final examinations, measurements and performance requirements;
- deviations from test procedure;
- additional pass/fail criteria.

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## **Annex A** (informative)

### **Minimum temperature value in Finland**

The minimum temperature value in performance category (O, E, A and G) of IEC 61753-1 shall be  $-45\text{ °C}$  in Finland. This temperature range shall be used especially with those fibre optic passive components installed in unheated street cabinets and cable joint closures in manholes, in the ground or in telephone poles.

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