



BSI Standards Publication

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

Part 2-37: Tests — Cable bending for fibre optic closures

**National foreword**

This British Standard is the UK implementation of EN 61300-2-37:2016. It is identical to IEC 61300-2-37:2016. It supersedes BS EN 61300-2-37:2007 which is withdrawn.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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English Version

**Fibre optic interconnecting devices and passive components -  
Basic test and measurement procedures -  
Part 2-37: Tests - Cable bending for fibre optic closures  
(IEC 61300-2-37:2016)**

Dispositifs d'interconnexion et composants passifs  
fibroniques - Procédures fondamentales d'essais et de  
mesures - Partie 2-37: Essais - Courbure du câble pour les  
boîtiers pour fibres optiques  
(IEC 61300-2-37:2016)

Lichtwellenleiter - Verbindungselemente und passive  
Bauteile - Grundlegende Prüf- und Messverfahren -  
Teil 2-37: Prüfungen - Kabelbiegung bei Muffen  
(IEC 61300-2-37:2016)

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## European foreword

The text of document 86B/3975/FDIS, future edition 3 of IEC 61300-2-37, 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 approved by CENELEC as EN 61300-2-37:2016.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-02-25
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-05-25

This document supersedes EN 61300-2-37:2007.

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

IEC 61300-2-23	NOTE	Harmonized as EN 61300-2-23.
IEC 61300-3-3	NOTE	Harmonized as EN 61300-3-3.
IEC 61753-1	NOTE	Harmonized as EN 61753-1.

## Annex ZA (normative)

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

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61300-1	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 1: General and guidance	EN 61300-1	-
IEC 61300-2-38	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 2-38: Tests - Sealing for pressurized fibre optic closures	EN 61300-2-38	-
IEC 61300-3-1	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-1: Examinations and measurements - Visual examination	EN 61300-3-1	-
IEC 61300-3-28	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-28: Examinations and measurements - Transient loss	EN 61300-3-28	-

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING  
DEVICES AND PASSIVE COMPONENTS –  
BASIC TEST AND MEASUREMENT PROCEDURES –****Part 2-37: Tests – Cable bending for fibre optic closures**

## FOREWORD

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International Standard IEC 61300-2-37 has been prepared by sub-committee 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. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) substantial updating of Subclauses 4.1, 6.5, 6.7 and Figure 1;
- b) addition of severities which are determined by the number and direction of cable bends, test temperature and overpressure for each environmental category according to IEC 61753-1.

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

FDIS	Report on voting
86B/3975/FDIS	86B/3981/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 the parts in 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 website 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 2-37: Tests – Cable bending for fibre optic closures

### 1 Scope

This part of IEC 61300 describes a test for the effectiveness of the sealing and clamping hardware of a fibre optic closure when the cable entering or exiting the fibre optic closure is subjected to bending.

### 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.

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

IEC 61300-2-38, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-38: Tests – Sealing for pressurized fibre optic closures*

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 61300-3-28, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-28: Examinations and measurements – Transient loss*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **closure**

enclosure intended to provide protection to splices and joints against water and dust ingress

Note 1 to entry: Protection is provided by an overpressure/under-pressure sealing of at least 20 kPa or complete inner filling or free-breathing method.

#### 3.2

##### **climatic chamber**

chamber needed for conditioning the device under test

#### 3.3

##### **holding fixture**

fixture for mounting the DUT

#### 3.4

##### **bending device**

device for applying a controlled bending moment to the cable

## 4 General description

### 4.1 Device under test (DUT)

The DUT is defined as an assembled closure with cable comprising all necessary parts for the required function. Separate DUTs for sealing performance and optical evaluation may be used.

The sealing performance DUT shall be provided with an air pressure test access valve. The length of the cables extending from the DUT shall be at least 1 m. The open ends of the cables shall be sealed. Each applicable cable type with minimum and maximum cable dimensions shall be represented in the test program. Multiple DUTs may be required to accommodate these cables.

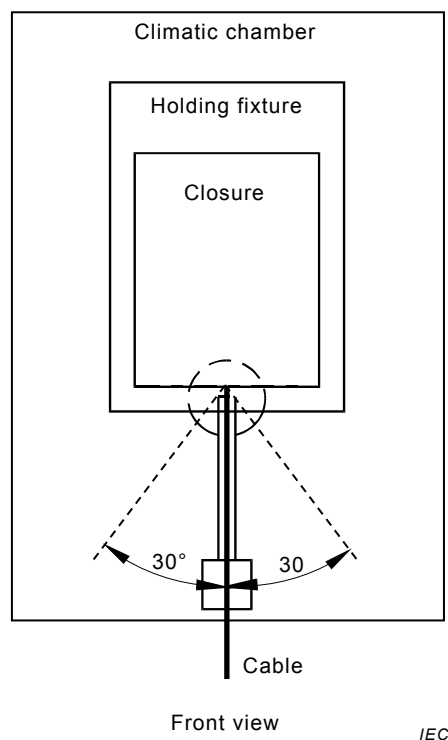
The optical evaluation DUT shall be constructed in such a way that it represents all allowed functions of the product. This shall be realised by building optical circuits for each fibre separation level. Each applicable cable type with minimum and maximum cable dimensions shall be represented in the test program.

### 4.2 Test procedure

The DUT shall be securely fixed and placed in a conditioning chamber. The cable shall be subjected to a specified number of bending cycles. A bending cycle shall consist of a bend in one direction followed by an equal bend in the opposite direction and a return to the original position. A force adequate to produce the specified bending shall be applied smoothly and in a controlled manner to the cable at the specified distance from the closure outlet. Examinations and measurements for damage of the cable, the closure, and the cable-to-closure seal as well as hardware failure inside closure shall be made after the test.

## 5 Apparatus

An example of the test apparatus is given in Figure 1.



**Figure 1 – Test apparatus**

The test apparatus consists of the following elements:

- holding fixture;
- bending device;
- climatic chamber.

## **6 Procedure**

### **6.1 Preparation of the DUT**

At room temperature, assemble a number of closure DUTs as defined in the relevant specification, using the smallest and largest diameter of the cable(s) for which the closure is designed, following the manufacturer's instructions. More DUTs than the minimum cited in the specification may be required to accommodate all applicable cable types and sizes and fibre separation levels. Mount the DUT to the holding fixture. Attach the cable to the device for applying the bending moment. Unless otherwise specified, clamp the cable at 400 mm from the end of the cable seal. For cables with outside diameter larger than 25 mm the length shall be increased to 1 000 mm from the end of the cable seal. Connect the fibres of the device under test to the optical circuit (if required). The number of the ports of the DUT to be used and the configuration of the optical circuit shall be specified in the relevant specification.

### **6.2 Pre-conditioning**

Place the device under test with the holding fixture in a climatic chamber and pre-condition it for 4 h at the standard test conditions specified in IEC 61300-1 unless otherwise specified in the relevant specification.

### **6.3 Initial measurements**

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

### **6.4 Conditioning**

The following procedure shall be accomplished:

- condition the sample at the test temperature for either 4 h or as otherwise specified in the relevant specification;
- pressurize the closure to the specified pressure, if required;
- measure the pressure according to the test method B of IEC 61300-2-38.

Conditioning of the DUT at other lower and/or higher temperatures shall be specified in the relevant specification.

### **6.5 Bending procedure**

Move the clamp to the specified angle. The applied bending force shall not exceed 500 N. If no angle is specified, bending to an angle of  $\pm 30^\circ$  is recommended. When applying the bends, change from one extreme position to another within 15 s. Maintain the cable bend for a specified time in each direction. If duration is not specified, maintain the cable bend position for 5 min in each direction. Apply the specified number of bending cycles. Repeat bending at the axis perpendicular to the initially tested axis. Repeat at other axes if specified.

If required in the relevant specification, perform the transient loss measurement during the test according to IEC 61300-3-28.

Measure the pressure according to the test method B of IEC 61300-2-38.

Unless otherwise specified, repeat the test for each cable protruding from the closure.

## 6.6 Recovery

Allow the DUT to recover under standard test conditions for 4 h, as defined in IEC 61300-1, unless otherwise specified in the relevant specification.

## 6.7 Final measurements

On completion of the test, perform the final measurements, as defined in the relevant specification. The results of the final measurement shall be within the limit established in the relevant specification.

For the sealing test of the DUT, the sealing performance shall be checked according to test method A of IEC 61300-2-38.

For the optical evaluation of the DUT, the variation of the attenuation shall be measured according to IEC 61300-3-28.

Visually examine the DUT in accordance with IEC 61300-3-1. Check for evidence of any degradation in the device under test. This may include, for example:

- broken, loose or damaged parts or accessories;
- breaking or damage to the cable jacket, seals, cable clamps.

## 7 Severity

The severity is determined by the number and direction of cable bends, test temperature and overpressure for each environmental category according to IEC 61753-1. The severity shall be specified in the relevant specification. Recommended values of the test parameters are given in Table 1.

**Table 1 – Test severities**

Environmental category	Test parameters	Sealing test DUT	Optical test DUT
C	Bending angle: Duration at extreme positions: Number of cycles: Test temperature: Overpressure:	$\pm 30^\circ$ 5 min 5 per cable $(-5 \pm 2)^\circ\text{C}$ and $(+45 \pm 2)^\circ\text{C}$ 0 kPa	$\pm 30^\circ$ 5 min 5 per cable $+23^\circ\text{C}$ 0 kPa
A and G	Bending angle: Duration at extreme positions: Number of cycles: Test temperature: Overpressure:	$\pm 30^\circ$ 5 min 5 per cable $(-15 \pm 2)^\circ\text{C}$ and $(+45 \pm 2)^\circ\text{C}$ 0 kPa	$\pm 30^\circ$ 5 min 5 per cable $+23^\circ\text{C}$ 0 kPa
S	Bending angle: Duration at extreme positions: Number of cycles:	$\pm 30^\circ$ 5 min 5 per cable	$\pm 30^\circ$ 5 min 5 per cable

Environmental category	Test parameters	Sealing test DUT	Optical test DUT
	Test temperature:  Overpressure at test temperature:	$(-15 \pm 2) \text{ }^{\circ}\text{C}$ and $(+45 \pm 2) \text{ }^{\circ}\text{C}$  $(40 \pm 2) \text{ kPa}$	$+23 \text{ }^{\circ}\text{C}$  0 kPa

## 8 Details to be specified

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

- type, diameter and length of cable to be used;
- number of cables entering or exiting the closure to be tested;
- DUT mounting instructions;
- rate of bending and any stops or holding periods during the cycle;
- clamping location of the cable;
- configuration of the monitoring circuit for optical measurements;
- initial examinations and measurements and performance requirements;
- optical measurements and performance requirements during the test
- final examinations and measurements and performance requirements;
- deviations from the test procedure;
- additional pass/fail criteria.

## Bibliography

IEC 61300-2-23, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-23: Tests – Sealing for non-pressurized closures of fibre optic devices*

IEC 61300-3-3, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-3: Examinations and measurements – Active monitoring of changes in attenuation and return loss*

IEC 61753-1, *Fibre optic interconnecting devices and passive components performance standard – Part 1: General and guidance for performance standards*

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