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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Standards.iteh.ai) Part 1: General and guidance

Dispositifs d'interconnexion et composants passifs fibroniques – Procédures fondamentales d'essais et de mesures – 61300-1-2016 Partie 1: Généralités et lignes directrices





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IEC Central Office	Tel.: +41 22 919 02 11
3, rue de Varembé	Fax: +41 22 919 03 00
CH-1211 Geneva 20	info@iec.ch
Switzerland	www.iec.ch

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Edition 4.0 2016-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures (standards.iteh.ai) Part 1: General and guidance

IEC 61300-1:2016

Dispositifs d'interconnexion et composants/passifs_fibroniques – Procédures fondamentales d'essais et de mésures - 61300-1-2016 Partie 1: Généralités et lignes directrices

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: General and guidance

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61300-1 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre Optics.

This fourth edition cancels and replaces the third edition published in 2011. This edition constitutes a technical revision.

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

- a) reconsideration of the terms and definitions;
- b) addition of Clause 4.

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

FDIS	Report on voting
86B/3992/FDIS	86B/4008/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 in the IEC 61300 series, published under the general title, *Fibre optic interconnecting 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

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INTRODUCTION

The publications in the IEC 61300 series contain information on mechanical and environmental testing procedures and measurement procedures relating to fibre optic interconnecting devices and passive components. They are intended to be used to achieve uniformity and reproducibility in environmental testing procedures and measurement procedures.

The term "test procedure" refers to procedures commonly known as mechanical and environmental tests. The expressions "environmental conditioning" and "environmental testing" refer to the environments to which components or equipment may be exposed so that an assessment may be made of their performance under the conditions of use, transport and storage.

The term "measurement procedure" refers to those measurements which are necessary to assess the physical and optical characteristics of a component and may also be used before, during or after a test procedure to measure the effects of environmental conditioning or testing. The return loss and attenuation tests are examples of measurement procedures.

The requirements for the performance of components or equipment subjected to the test and measurement procedures described in this part of IEC 61300 are not included. The relevant specification for the device under test defines the allowed performance limits.

When drafting a specification or purchase contract, only those tests which are necessary for the relevant components or equipment taking into account the technical and economic aspects should be specified. (standards.iteh.ai)

The mechanical and environmental test procedures are contained in the IEC 61300-2 series and the measurement procedures in the IEC 61300-3 series. Each test or measurement procedure is published as a stand-alone publication so that it may be modified, expanded or cancelled without having an effect on any other test or measurement procedure. However it should be noted that, where practical, reference is made to other standards as opposed to repeating all or part of already existing standards. As an example, the cold test for fibre optic apparatus refers to IEC 60068-2-1, but it also provides other needed information such as purpose, recommended severities and a list of items to be specified.

Multiple methods may be contained in a test or measurement procedure. As an example, several methods of measuring attenuation are contained in the attenuation measurement procedure.

If more than one method is contained in a test or measurement procedure, the reference method may be identified.

The tests in this standard permit the performance of components or equipment to be compared. To assess the overall quality of a production lot, the test procedures should be applied in accordance with a suitable sampling plan and may be supplemented by appropriate additional tests, if necessary.

To provide tests appropriate to the different intensities of an environmental condition, some of the test procedures have a number of degrees of severity. These different degrees of severity are obtained by varying the time, temperature or some other determining factor separately or in combination.

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

Part 1: General and guidance

1 Scope

This part of IEC 61300 provides general information and guidance for the basic test and measurement procedures defined in the IEC 61300-2 and IEC 61300-3 series for interconnecting devices and passive components.

This standard should be used in combination with the relevant specification which will define the tests to be used, the required degree of severity for each of them, their sequence, if relevant, and the permissible performance limits. In the event of conflict between this basic standard and the relevant specification, the latter will take precedence.

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 61300-1:2016

IEC 60050-731, Internationalis Electrotechnical ds Vocabulary - 2acc Chapter 2-731: Optical fibre odc3b9d33372/iec-61300-1-2016

IEC 60617, Graphical symbols for diagrams (available at http://std.iec.ch/iec60617)

IEC 60793-2-10, Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres

IEC 60793-2-30, Optical fibres – Part 2-30: Product specifications – Sectional specification for category A3 multimode fibres

IEC 60793-2-40, Optical fibres – Part 2-40: Product specifications – Sectional specification for category A4 multimode fibres

IEC 60825-1, Safety of laser products – Part 1: Equipment classification and requirements

IEC 60825-2, Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)

IEC 61280-1-4, Fibre optic communication subsystem test procedures – Part 1-4: General communication subsystems – Light source encircled flux measurement method

IEC 61280-4-1, Fibre optic communication subsystem test procedures – Part 4-1: Installed cable plant – Multimode attenuation measurement

IEC 61300-2 (all parts), Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Tests

IEC 61300-3 (all parts), Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Examinations and measurements

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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 61300-3-35, Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – Visual inspection of fibre optic connectors and fibre-stub transceivers

IEC 61300-3-53, Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-53: Examinations and measurements – Encircled angular flux (EAF) measurement method based on two-dimensional far field data from step index multimode waveguide (including fibre)

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

test

technical operation that consists of the determination of one or more characteristics of a given product, process or service according to a specified procedure and normally consists of the following steps: **(standards.iten.al)**

- a) preparation (where required);
- b) pre-conditioning(where required) atalog/standards/sist/46c46721-2acc-4ce6-9822-
- c) initial examination and measurement (where required);¹⁶
- d) conditioning;
- e) recovery (where required);
- f) final examination and measurement.

3.1.2

device under test

DUT

interconnecting device, passive component, equipment or other item designated to be tested

3.1.3

preparation

preparing the DUT according to the manufacturer's instructions or as specified in the relevant specification

3.1.4

pre-conditioning

treatment of a DUT with the object of removing or partly counteracting the effects of its previous environmental history

3.1.5

conditioning

exposure of a DUT to environmental conditions for a specified duration in order to determine the effects of such conditions on the DUT

3.1.6

recovery

treatment of a DUT after conditioning in order that the properties of the DUT may stabilise before measurement

3.1.7

examination

visual and/or mechanical inspection of a DUT made with or without the use of special equipment

Note 1 to entry: Usually carried out before and after the test, and/or during the test.

3.1.8

measurement

process of obtaining one or more values that can reasonably be attributed to a quantity

[SOURCE: IEC 60050:2010, 112-04-01, modified - The adverb "experimentally" has been removed from the definition, as well as the notes.]

3.1.9

encircled flux

EF

fraction of cumulative near-field power to the total output power as a function of radial distance from the optical centre of the core, defined by Equation (1),

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 $(stand a) = \underbrace{dst(w) dx}_{\int_0^R xI(x) dx}$ (1) IEC 61300-1:2016

where

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I(x) is the near-field intensity profile as a function of radial position, r;

R is the maximum range of integration

Note 1 to entry: *EF* shall be measured according to IEC 61280-1-4.

3.1.10 encircled angular flux

EAF

fraction of cumulative far-field power to the total output power as a function of incident angle θ from the optical central axis of the far-field pattern, defined by Equation (2),

$$EAF(\theta') = \frac{\int_{0}^{2\pi} \int_{0}^{\theta'} I(r,\varphi) \frac{\sin(\theta)}{\cos^{3}(\theta)} d\theta d\varphi}{\int_{0}^{2\pi} \int_{0}^{\theta \max} I(r,\varphi) \frac{\sin(\theta)}{\cos^{3}(\theta)} d\theta d\varphi}$$
(2)

where

is the 2 dimensional far-field intensity profile as a function of moving radius $I(r, \varphi)$ r and argument φ ;

incident angle $\theta' = tan - 1(r/d);$

d	is the distance between luminescent point and far field screen; and
θmax	is the maximum range of integration.

Note 1 to entry: EAF shall be measured according to IEC 61300-3-53.

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply:

- differential mode dispersion DMA
- DUT device under test
- EAF encircled angular flux
- EF encircled flux
- LED light emitting diode
- SL step index

Requirements for the IEC 61300-2 series and the IEC 61300-3 series 4

4.1 Requirements for the IEC 61300-2 series

The IEC 61300-2 series shall contain these items:

- test apparatus;
- test procedures, stated in the test requirements;
- severities:
- details to be specified. •

Requirements for the IEC 61300-3 series PREVIEW 4.2

General requirements (standards.iteh.ai) 4.2.1

The IEC 61300-3 series shall contain these ditems 2016

- https://standards.iteh.ai/catalog/standards/sist/46c46721-2acc-4ce6-9822measurement apparatus;
 - 9dc3b9d33372/jec-61300-1-2016
- measurement procedures; •
- method of calculation (where required);
- measurement uncertainty;
- details to be specified.

4.2.2 **Requirements for attenuation variation**

For interconnection devices, the attenuation variation is defined as the peak-to-peak variation of attenuation during the test, unless otherwise specified.

For passive optical components, the attenuation variation is defined as a plus or minus deviation from the original value at the start of the test, unless otherwise specified.

Standard atmospheric conditions 5

Standard atmospheric conditions shall be controlled within some range to ensure proper correlation of data obtained from measurements and tests conducted in various facilities. Test and measurement procedures shall be conducted under the following atmospheric conditions unless otherwise specified. In some cases, special ambient conditions may be needed and can be specified in the relevant specification.

The standard range of atmospheric conditions for carrying out measurements and tests is set out in Table 1.

Temperature	Relative humidity	Air pressure
18 °C to 28 °C	25 % to 75 %	86 kPa to 106 kPa

Table 1 – Standard atmospheric conditions

Variations in ambient temperature and humidity shall be kept to a minimum during a series of measurements.

6 Significance of the numerical value of a quantity

6.1 General

The numerical values of quantities for the various parameters (temperature, humidity, stress, duration, optical power levels, etc.) given in the basic methods of environmental and optical testing constituting the IEC 61300-2 series and the optical and physical measurements constituting the IEC 61300-3 series are expressed in different ways according to the needs of each individual test.

The two cases that most frequently arise are:

- a) the quantity is expressed as a nominal value with a tolerance;

b) the quantity is expressed as a range of values. II the STANDARD PREVIEW For these two cases, the significance of the numerical value is discussed in 6.2 and 6.3.

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6.2 Quantity expressed as nominal value with tolerance

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Examples of two forms of apresentation arg standards/sist/46c46721-2acc-4ce6-9822-

a) 40 mm ± 2 mm

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 $2 s \pm 0.5 s$

 $0,3~dB\pm0,1~dB$

b) 93 % $^{+3}_{-2}$ %

The expression of a quantity as a numerical value indicates the intention that the test should be carried out at the stated value. The object of stating tolerances is to take account of the following factors in particular:

- the difficulties in regulating some devices and their drift (undesired slow variation) during the test:
- uncertainties of instrument;
- non-uniformity of environmental parameters, for which no specific tolerances are given, in the test space in which the DUTs are located.

These tolerances are not intended to allow latitude in the adjustment of the values of the parameter within the test space. Hence, when a quantity is expressed by a nominal value with a tolerance, the test apparatus shall be adjusted so as to obtain this nominal value making allowance for the uncertainties of instrument.

In principle, the test apparatus shall not be adjusted to maintain a limiting value of the tolerance zone, even if its uncertainty is so small as to ensure that this limiting value would not be exceeded.