SLOVENSKI STANDARD

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Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-2: Examinations and measurements - Polarization dependence of attenuation in single-mode fibre optic device (IEC 61300-3-2:1999)

Fibre optic interconnecting devices and passive components - Basic tests and measurement procedures -- Part 3-2: Examinations and measurements - Polarization dependence of attenuation in a single-mode fibre optic device

Lichtwellenleiter - Verbindungselemente und passive Bauteile - Grundlegende Prüf- und Meßverfahren -- Teil 3-2: Untersuchungen und Messungen - Polarisationsabhängigkeit von Einmoden-Lichtwellenleiter-Bauteilen

Dispositifs d'interconnexion et composants passifs à fibres optiques - Méthodes fondamentales d'essais et de mesures -- Partie 3-2: Examens et mesures - Dépendance à la polarisation de l'affaiblissement dans un dispositif pour fibres optiques monomodes

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Fibre optic interconnecting devices and passive components Basic tests and measurement procedures Part 3-2: Examinations and measurements - Polarization dependence of attenuation in a single-mode fibre optic device (IEC 61300-3-2:1999)

Dispositifs d'interconnexion et composants passifs à fibres optiques Méthodes fondamentales d'essais et de mesures Partie 3-2: Examens et mesures Dépendance à la polarisation de l'affaiblissement dans un dispositif pour fibres optiques monomodes (CEI 61300-3-2:1999)

Lichtwellenleiter - Verbindungselemente und passive Bauteile - Grundlegende Prüf- und Meßverfahren Teil 3-2: Untersuchungen und Messungen - Polarisationsabhängigkeit von Einmoden-Lichtwellenleiter-Bauteilen (IEC 61300-3-2:1999)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

The text of document 86B/1197/FDIS, future edition 2 of IEC 61300-3-2, 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 61300-3-2 on 1999-08-01.

This European Standard supersedes EN 61300-3-2:1997.

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)	2000-05-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2002-08-01

Endorsement notice

The text of the International Standard IEC 61300-3-2:1999 was approved by CENELEC as a European Standard without any modification.

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Dispositifs d'interconnexion et composants passifs à fibres optiques – Méthodes fondamentales d'essais et de mesures –

Partie 3-2: Examens et mesures – Dépendance à la polarisation de l'affaiblissement dans un dispositif pour fibres optiques monomodes

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –

Part 3-2: Examinations and measurements – Polarization dependence of attenuation in a single-mode fibre optic device

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 3-2: Examinations and measurements – Polarization dependence of attenuation in a single-mode fibre optic device

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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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3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61300-3-2 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 1995, and constitutes a technical revision.

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

FDIS	Report on voting
86B/1197/FDIS	86B/1231/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 3.

IEC 61300 consists of the following parts, under the general title: *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures:*

– Part 1: General and guidance
– Part 2: Tests
– Part 3: Examinations and measurements

Annex A is for information only.

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

Part 3-2: Examinations and measurements – Polarization dependence of attenuation in a single-mode fibre optic device

1 General

1.1 Scope and object

The object of this part of IEC 61300 is to determine the dependence of attenuation in single-mode fibre optic devices to changes in polarization. This procedure can be applied to any single-mode interconnecting device and passive component, including connectors, splices, branching devices, attenuators, isolators and switches. It is used to measure the total range of attenuation, Δa, due to changes in polarization of the launch state. For branching devices, it can also be used to measure the total range of coupling ratio, $\Delta CR(i)$. It cannot be used to measure the polarization dependence of return loss.

1.2 General description

Two methods for measuring polarization dependence of attenuation are described. Method A determines the maximum polarization sensitivity over all possible polarization states including linear, circular and elliptical. Method B determines the maximum polarization sensitivity over all linearly polarized launch states. Method A is preferred, particularly for any device in which the generic polarization state of light passing through the device is changed. Method B generally understates the polarization sensitivity of devices which are not dependent on linearly polarized light. Therefore, it is not recommended for tests where the device under test (DUT) has not been characterized as being sensitive to purely linear polarized light.

Two options are allowed for making the measurement:

a) cutback or substitution fibre;

b) ratio measurement.

Option a) shall be used to arbitrate disagreements in the options. Option b) is the most convenient one for typical apparatus using method A.

1.2.1 Method A

Light is launched into the input port of the DUT such that linear, circular, and elliptical states of polarization with different axes of orientation can be adjusted while the power from the output port is monitored. The input power is also monitored by tapping some of the power through a polarization-independent branching device.

By adjusting for maximum and minimum power through the component, the polarization sensitivity of the attenuation can be obtained. For branching devices, this method can also be used to measure the total range of coupling ratio.

1.2.2 Method B

Linearly polarized light is injected into the launch end of the DUT. The launch lead of the device shall be deployed in a straight line without any external stresses, for example bends, twists, kinks or tension. This is necessary because the state of polarization carried in the fibre is altered by external stresses.

The return leads may be deployed with bends as long as they are large enough not to induce bend loss (e.g. bend diameters greater than 90 mm). If the state of polarization is altered by a bend in the output optical path, the polarization-dependent loss should not be altered since there are no polarization-sensitive components in the output optical path.

The linear state of polarization of the launch is typically rotated through a minimum of 180° while the power from the output of the device under test is measured. If the launch power varies as a function of the launched state of linear polarization, this variation may be referenced out.

The power from the source may be measured through an equivalent 180° cycle using a cutback length from the input of the device under test or using an equivalent length of fibre similar to the device under test in substitution as long as equivalence to the cutback measurement can be demonstrated.

2 Apparatus

The following apparatus and equipment are required to perform this test.

a) *Optical source S*

An optical source capable of producing the spectral characteristics defined in the relevant specifications (both wavelength and spectral width) shall be used. Unless specified in the relevant specifications, the spectral width shall be less than 10 nm.

The source power shall be capable of meeting the dynamic range requirements of the measurement when combined with the detector sensitivity.

The power, polarization state and wavelength stability of the source shall be sufficient to achieve the specified measurement accuracy over the course of the measurement. An example of such a source is a tungsten bulb combined with a spectrally filtering monochromator. For some applications, a narrow linewidth source, such as a single longitudinal mode laser, may be used.

NOTE – Multimode lasers may not provide sufficient polarization stability required for this measurement.

b) *Excitation unit E*

This unit consists of a passive optical system which transmits the optical power to the component. Means shall be provided to ensure that the DUT is single-moded at the wavelength of the measurement. A bend in the output pigtail of the DUT may be used to filter any second-order mode power.

c) Temporary joint TJ

This is a method, device, or mechanical fixture for temporarily aligning two fibre ends into a reproducible low loss joint. This may be a direct optical launch into the pigtail or a splice on the source pigtail. Typically, a fusion splice is used after the polarization adjuster since mechanical splices may exhibit some polarization sensitivity if the endfaces are not perpendicular to the fibre axis. The stability of the temporary joint shall be compatible with the required measurement precision.

d) Polarization adjuster

Method A

A means shall be provided to reproducibly adjust the polarization of the launch through all possible states. The choice of the polarization adjuster type depends on the required performances by the measurement apparatus, for instance, in terms of precision, repeatability, measurement time and cost. Some examples of polarization adjusters are provided as follows.

– *Bulk optics elements*

  This shall be formed by a cascade of three polarization selective optical elements (only two optical elements may be sufficient if the state of polarization before the polarization adjuster is perfectly known). The alignment of the system shall be adequate to ensure the reproducibility of launched power for the same orientation of the optical elements. The example in figure 1a shows a linear polarizer P, a half-wave retardation plate H, and a quarter-wave retardation plate Q mounted on rotation stages and inserted into a collimated optical path produced at the output of the monochromator. This kind of polarization control unit is the most accurate one.

– *In-line all-fibre polarization adjusters*

  This may be formed by a cascade of three rotatable mandrels around which single-mode optical fibre is wound (see annex A). This solution is shown in figure 1b.

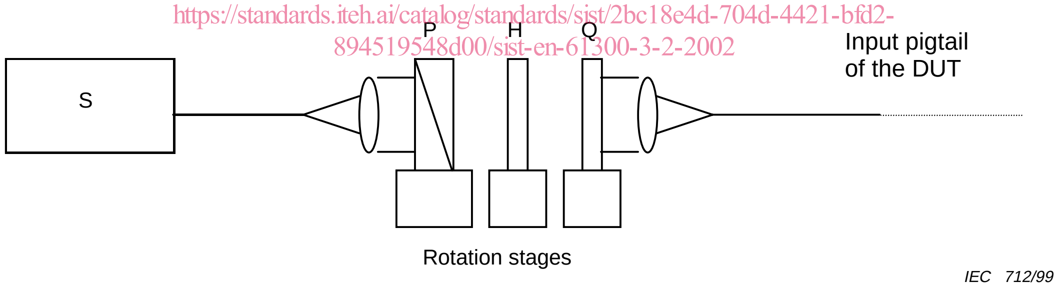

Figure 1a – Bulk optics

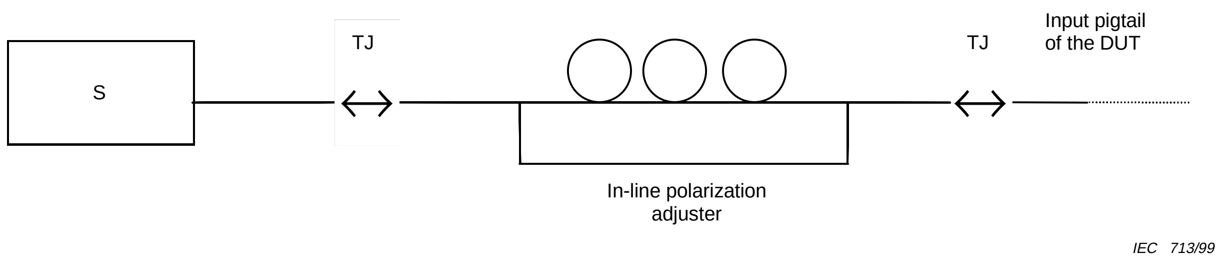

Figure 1b – In-line all-fibre polarization adjuster

Figure 1 – Examples of method A launch apparatus