SLOVENSKI STANDARD

SIST EN 61300-3-6:2004

september 2004

Povezovalne naprave in pasivne komponente optičnih vlaken – Postopki osnovnega preskušanja in merjenja – 3-6. del: Preiskovanje in meritve; povratna izguba (IEC 61300-3-6:2003)*

Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-6: Examinations and measurements - Return loss (IEC 61300-3-6:2003)

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ICS 33.180.20 Supersedes EN 61300-3-6:1997 + A1:1998 + A2:1999

English version

Fibre optic interconnecting devices and passive components - Basic test and measurement procedures Part 3-6: Examinations and measurements - Return loss

(IEC 61300-3-6:2003)

Dispositifs d'interconnexion et composants passifs à fibres optiques - Méthodes fondamentales d'essais et de mesures Partie 3-6: Examens et mesures - Puissance réfléchie (CEI 61300-3-6:2003)

Lichtwellenleiter-Verbindungselemente und passive Bauteile - Grundlegende Prüf- und Messverfahren Teil 3-6: Untersuchungen und Messungen - Rückflussdämpfung (IEC 61300-3-6:2003)

This European Standard was approved by CENELEC on 2003-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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

Ref. No. EN 61300-3-6:2003 E

Foreword

The text of document 86B/1778/FDIS, future edition 2 of IEC 61300-3-6, 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 61300-3-6 on 2003-03-01.

This European Standard supersedes EN 61300-3-6:1997 + A1:1998 + A2:1999.

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) 2003-12-01

– latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-03-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA normative and annex A is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61300-3-6:2003 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

Publication	Year	Title	EN/HD	Year
IEC 60793-2	Series	Optical fibres Part 2: Product specifications	EN 60793-2	Series
IEC 61300-1	- [1)]	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures Part 1: General and guidance	EN 61300-1	1997 [2)]
IEC 61300-3-1	- [1)]	Part 3-1: Examinations and measurements - Visual examination	EN 61300-3-1	1997 [2)]
IEC 61300-3-39	- [1)]	Part 3-39: Examinations and measurements - PC optical connector reference plug selection	EN 61300-3-39	1997 [2)]

1) Undated reference.

2) Valid edition at date of issue.

INTERNATIONAL STANDARD

IEC 61300-3-6

Second edition
2003-02

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

Part 3-6: Examinations and measurements – Return loss

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

Partie 3-6: Examens et mesures – Puissance réfléchie

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 3-6: Examinations and measurements – Return loss

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.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
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 61300-3-6 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 1997 and its amendments 1 (1998) and 2 (1999). This edition constitutes a technical revision.

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

FDIS	Report on voting
86B/1778/FDIS	86B/1832/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.

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

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

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

A bilingual version of this publication may be issued at a later date.

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

Part 3-6: Examinations and measurements – Return loss

1 Scope

This part of IEC 61300 presents procedures for the measurement of the return loss (RL) of a fibre optic device under test (DUT). RL, as used in this standard, is the ratio of the power (P_i) incident on, or entering, the DUT to the total power reflected (P_r) by the DUT, expressed in decibels:

$$RL = -10 \cdot \log\left(\frac{P_r}{P_i}\right) \quad (1)$$

Return loss is a positive number.

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 60793-2 (all parts), *Optical fibres – Product specifications*

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 61300-3-39, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-39: Examinations and measurements – PC optical connector reference plug selection*

3 General description

Four methods will be presented for measuring optical return loss:

– measurement with an optical continuous wave reflectometer (OCWR) (method 1);
– measurement with an optical time domain reflectometer (OTDR) (method 2);
– measurement with an optical low coherence reflectometry (OLCR) (method 3);
– measurement with an optical frequency domain reflectometry (OFDR) (method 4).

These four measurement methods have different characteristics and different applications in terms of spatial resolution and detectable RL (in annex A a comparison of return loss detectable by the four different methods is reported).

3.1 Method 1

This technique is the nearest to the theoretical definition of return loss given by equation (1). It measures directly the incident power and the reflected power. It is not affected by instrumental data processing and it gives absolute measurement values, which are not relative to a reference reflection (technique A). This method has some limiting factors: it cannot spatially resolve two different reflections on the line and its dynamic range is limited by the characteristics of the branching device and by the ability to suppress the reflections beyond the one from the DUT.

3.2 Method 2

This method allows measurement of RL from reflection points on an optical line, with a spatial resolution in the metre range and with a dynamic range of more than 75 dB (depending on the pulse width) using an OTDR instrument.

The OTDR measurement method is very suitable for field measurements where it is necessary to measure RLs on long optical lines.

3.3 Method 3

The purpose of this method is to measure reflection profiles of single-mode optical devices with a micrometre spatial resolution and a high dynamic range (>90 dB) by using optical low-coherence interference.

The reflection profile is defined as a distribution of reflections at individual end-faces and/or connected points in single-mode optical devices. When the reflection at a particular point is $-R$ (dB), the return loss at this point is given by R (dB). This method measures the reflection at a point by detecting the power of a beat signal produced by optical interference between the reflected light and the reference light. When a component with dispersed reflections is analysed, each reflection can be identified and located, provided their separation is greater than the spatial resolution of the measurement system.

3.4 Method 4

The purpose of this procedure is to measure the return loss of single-mode optical devices with a spatial resolution in the centimetre range and high dynamic range (>70 dB) by using optical frequency domain reflectometry

One of the prime benefits of this technique is the ability to spatially resolve the desired reflection from undesired ones, such as all of the connectors or unterminated ports on the DUT, without any dead zone. Moreover, the OFDR method is highly reliable and the apparatus can be compact.

Measurement in the frequency domain is based on the ability to convert information in the time domain by means of an inverse Fourier transform. In this way with a source modulated from some kHz to 1 GHz, it is possible to resolve two reflective points on an optical line separated by some centimetres.

3.5 Selection of reference measurement method

Due to the different characteristics of these methods, and their different application fields, the reference method depends on the type of DUT. For a component with RL ≤ 55 dB the reference is method 1, for a component with RL > 55 dB the reference is method 2 using a pulse duration less than 100 ns. In cases in which it is necessary to resolve more reflection points separated by a distance of less than 5 m, the reference shall be method 3.