SLOVENSKI STANDARD

SIST EN 61300-3-6:1997/A2:2001

01-februar-2001

Fibre optic interconnecting devices and passive components - Basic test and mesurement procedures - Part 3-6: Examinations and mesurements - Return loss - Amendment A2 (IEC 61300-3-6:1997/A2:1999)

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

Lichtwellenleiter - Verbindungselemente und passive Bauteile - Grundlegende Prüf- und Meßverfahren -- Teil 3-6: Untersuchungen und Messungen - Rückflußdämpfung

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

Ta slovenski standard je istoveten z: EN 61300-3-6:1997/A2:1999

ICS:

33.180.20	Povezovalne naprave za optiļ na vlakna	Fibre optic interconnecting devices

SIST EN 61300-3-6:1997/A2:2001 en

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61300-3-6/A2

May 1999

ICS 33.180.20

English version

Fibre optic interconnecting devices and passive components Basic test and measurement procedures Part 3-6: Examinations and measurements - Return loss (IEC 61300-3-6:1997/A2:1999)

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 61300-3-6:1997/A2:1999)

Lichtwellenleiter - Verbindungselemente und passive Bauteile - Grundlegende Prüf- und Meßverfahren Teil 3-6: Untersuchungen und Messungen - Rückflußdämpfung (IEC 61300-3-6:1997/A2:1999)

This amendment A2 modifies the European Standard EN 61300-3-6:1997; it was approved by CENELEC on 1999-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 amendment 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.

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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

Ref. No. EN 61300-3-6:1997/A2:1999 E

Foreword

The text of document 86B/1178/FDIS, future amendment 2 to 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 amendment A2 to EN 61300-3-6:1997 on 1999-05-01.

The following dates were fixed:

– latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2000-02-01
– latest date by which the national standards conflicting with the amendment have to be withdrawn	(dow)	2002-05-01

Endorsement notice

The text of amendment 2:1999 to the International Standard IEC 61300-3-6:1997 was approved by CENELEC as an amendment to the European Standard without any modification.

NORME INTERNATIONALE
INTERNATIONAL STANDARD

CEI
IEC
61300-3-6

1997

AMENDEMENT 2
AMENDMENT 2
1999-04

Amendement 2

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

Partie 3-6:

Examens et mesures –
Puissance réfléchie

Amendment 2

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

Part 3-6:
Examinations and measurements –
Return loss

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE J

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FOREWORD

This amendment has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

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

FDIS	Report on voting
86B/1178/FDIS	86B/1201/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

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Add, under clause 3, the title of the following subclause:

3.5 Measurements with an optical frequency domain reflectometer (OFDR)

Add, under clause 4, the title of the following subclause:

4.4 Measurement of return loss with an OFDR

Add, under clause 5, the title of the following subclause:

5.4 Measurement of return loss with an OFDR

Add the titles of annexes A and B as follows:

Annex A (normative) Response resolution and range resolution in OFDR measurement

Annex B (informative) Comparison of return loss detectable by four different methods

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1 General

1.1 Scope and object

Add the following new paragraph:

The purpose of this procedure is to measure the return loss of single optical devices with a spatial resolution in the centimetre range and high dynamic range by using an optical frequency domain reflectometer.

2 General description

Add the following new paragraph:

This additional procedure describes the measurement of the return loss of a single-mode optical device with an optical frequency domain reflectometer, OFDR.

One of the prime benefits of this technique is the ability to resolve spatially the desired reflection from undesired ones, such as those of all 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 so as to be maintenance free. (In annex B a comparison of return loss detectable by four different methods is reported.)

The measurement concept of the OFDR technique can be described as follows. The intensity modulated signal from the lightwave source is transmitted through the optical medium, the DUT being most commonly made or connected by optical fibres, although it could be an open-beam environment. The optical signal incident upon the DUT is of the form:

$$f(t) = a(t)\cos(\omega t) \qquad (1)$$

where

$a(t)$ is the RF modulation;

$\cos(\omega t)$ represents the lightwave carrier signal at a given wavelength.

The DUT acts on the amplitude of both the modulation envelope and the carrier signal identically and delays both signals by the same amounts, yielding the following relationships for the DUT output:

$$F(t) = |H|\,a(t+\Delta t)\cos(\omega(t+\Delta t)) \qquad (2)$$

where

$|H|$ is the magnitude of the transfer function of the DUT;

$\Delta\varphi = \omega\Delta t$ is the phase variation of H.

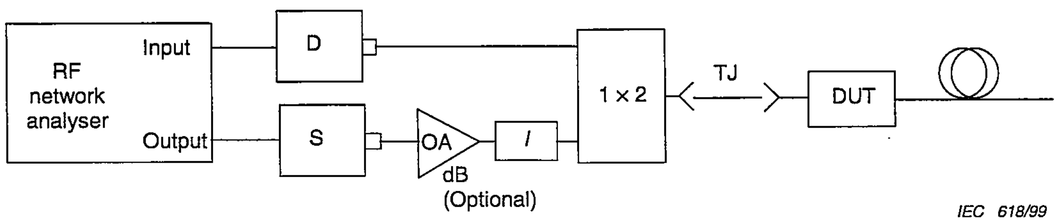
The influence of the DUT is determined by measuring the modulation envelope.

3 Apparatus and symbols

Add the following new subclauses:

3.5 Measurements with an optical frequency domain reflectometer (OFDR)

The experimental set-up using the OFDR is illustrated in figure 8.



IEC 618/99

Figure 8 – Set-up for OFDR measurement

For measurement of the return loss, the optically carried microwave propagates through 50 % of the BD to the DUT; then the back-reflected signal is split by the BD and reaches the photodiode. The receiver demodulates the optical signal and recovers the RF signal. Thus, the demodulated signal is compared in magnitude and in phase with the original signal (obtained from a known reflection) by the network analyser. By performing an inverse Fourier transform, which computes a time domain representation of the swept vector data, this technique allows the spatial resolution of the reflections coming back from the optical line, with resolution of a few centimetres or less (see annex A).

To prevent any degradation of the system performances due to optical feedback, the use of an optical isolator in front of the optical source is recommended.

3.5.1 RF network analyser

The RF network analyser is a vector network analyser able to measure both the intensity and the phase of the reflected power. The RF frequency drift should be minimized according to measurement accuracy (see note of 3.5.7).

3.5.2 Optical heads – Source S and receiver D

An optical emitter at the specified wavelength and an optical detector, both with their properly associated drive electronics and means of connecting to the network analyser and to optical fibres, respectively. The dynamic range of set-up shall be at least greater than 5 dB of the minimum RL to be measured. The system dynamic range is defined as the difference between the largest signal, i.e. 0 dB, and the signal 3 dB above the noise floor as measured in the time domain.

The following factors may give rise to a potential source of errors and could affect the measurement uncertainty (see note of 3.5.7):

- Laser wavelength drift with the temperature.
- The range in return loss power over which the detector is linear.
- The polarization sensitivity.

3.5.3 Optical amplifier – OA (optional)

An optical amplifier, used as a booster, may be added after the source in order to increase the emitted optical power and to enhance the dynamic range of the apparatus.

3.5.4 Isolator – I (optional)

An optical isolator may be placed in front of the source, if it is not already built in, in order to limit the reflected power which could degrade the source performances.

3.5.5 Branching device – BD

The splitting ratio is 50 % and the BD is insensitive to the polarization variations (<0,1 dB).

The directivity of the BD can affect the measurement accuracy and should be specified accordingly (see note of 3.5.7).

3.5.6 Temporary joint – TJ

A joint is made to connect the DUT to the branching device. Examples of TJs are connectors, splices or micro-manipulators. The loss of the TJ shall be stable with an insertion loss preferably better than 0,5 dB. The spacing between the TJ and the DUT shall be higher than the resolution of the measurement.

3.5.7 Computer

A computer for performing the inverse Fourier transform on the swept vector will be required if the facility is not included in the network analyser.

NOTE – The total uncertainty of the measurement is the sum of all the uncertainty factors mentioned above. A realistic approach would be to evaluate each of these factors starting with the total uncertainty allowed from the measurement specified in the detail specifications.

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4 Procedure

Add the following new subclauses:

4.4 Measurements of return loss with OFDR

Basically the measurement process consists of two steps:

a) calibration of the system;

b) measurement of the DUT by a substitution method.

4.4.1 Calibration

Perform an optical measurement calibration by measuring a standard device with a known reflection as specified in the relevant specifications. The most convenient standard reference is the Fresnel reflection of a cleaved single-mode fibre terminated in the air (≈14,6 dB).

4.4.2 Measurement

Substitute the known reflection with the DUT connected through a TJ and measure the return loss of the DUT by comparing the reflected signal and the reference signal on the vector network analyser.

For example, some system data are reported in table 1.

Table 1 – System data and dynamic range

Optical output power	Frequency span	IF bandwidth	Average signal	Calibration
–3 dBm	1 GHz	30 Hz	8	Fresnel

With these data, the measured system dynamic range is ~55 dB.