



**SLOVENSKI STANDARD**  
**SIST EN 61290-5-1:2002**  
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**Optical fibre amplifiers - Basic specification - Part 5-1: Test methods for reflectance parameters - Optical spectrum analyser (IEC 61290-5-1:2000)**

Optical fibre amplifiers - Basic specification -- Part 5-1: Test methods for reflectance parameters - Optical spectrum analyser

Lichtwellenleiter-Verstärker - Grundspezifikation -- Teil 5-1: Prüfverfahren für Reflektanzparameter - Optischer Spektralanalysator

Amplificateurs à fibres optiques - Spécification de base -- Partie 5-1: Méthodes d'essai des paramètres de réflectance - Analyseur de spectre optique

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**Ta slovenski standard je istoveten z: EN 61290-5-1:2000**

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**ICS:**

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**EN 61290-5-1**

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English version

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 Part 5-1: Test methods for reflectance parameters -  
 Optical spectrum analyser  
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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.

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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

## Foreword

The text of document 86C/270/FDIS, future edition 1 of 61290-5-1 prepared by SC 86C, Fibre optic systems and active devices, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as 61290-5-1 on 2000-06-01.

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) 2001-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-06-01

This European Standard is to be read in conjunction with EN 61291-1:1998.

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annex A is informative.

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 61290-5-1:2000 was approved by CENELEC as a European Standard without any modification.

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## INTRODUCTION

As far as can be determined, this is the first International Standard on this subject. The technology of optical fibre amplifiers is quite new and still emerging, hence amendments to and new editions of this standard can be expected.

Each abbreviation introduced in this standard is explained in the text at least the first time it appears. However, for an easier understanding of the whole text, a list of all abbreviations used in this standard is given in annex A.

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## OPTICAL FIBRE AMPLIFIERS – BASIC SPECIFICATION –

### Part 5-1: Test methods for reflectance parameters – Optical spectrum analyser

#### 1 Scope and object

This International Standard applies to optical fibre amplifiers (OFAs) using active fibres, containing rare-earth dopants, presently commercially available.

The object of this standard is to establish uniform requirements for accurate and reliable measurements, by means of the optical spectrum analyzer test method, of the following OFA parameters, as defined in clause 3 of IEC 61291-1:

- a) maximum input reflectance;
- b) minimum input reflectance;
- c) output reflectance.

NOTE All numerical values followed by (‡) are currently under consideration.

#### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61290. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61290 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 61291-1:1998, *Optical fibre amplifiers – Part 1: Generic specification*

NOTE A list of informative references is given in the bibliography.

#### 3 Apparatus

A scheme of the measurement set-up is given in figure 1.

The test equipments listed below, with the required characteristics, are needed.

The polarization-dependent loss variation of each optical passive component listed below shall

be better than 0,2 dB (‡).

- a) *Optical source*: The optical source shall be either at fixed wavelength or wavelength-tuneable. It shall generate light at wavelength specified in the relevant detail specification, and shall emit enough optical power to allow measurements of reflectance of –50 dB to –60 dB. The suppression ratio of side modes shall be higher than 30 dB(‡). An optical isolator with isolation greater than 40 dB shall be either integrated within the source package, or connected at the source output. The source shall be linearly polarized, in order to accomplish high precision measurements of amplified spontaneous emission (ASE) power within a narrow optical bandwidth.

NOTE A DFB laser or an external cavity laser can be suitable optical sources.

- b) *Optical coupler*: A 3 dB, 2 × 2 optical coupler is needed. It shall have an insertion loss lower than 3,5 dB (±) and a directivity not lower than 60 dB. Its input connectors shall have reflectance lower than -60 dB (±). Its output connector shall be of the same type as the OFA input connector. Its output unused port shall have a reflectance lower than -60 dB (±). The polarization dependent loss of the optical coupler shall be less than 0,5 dB (±).
- c) *Optical power meter*: This device is used for calibration purposes. It shall have a measurement accuracy better than ±0,2 dB, a dependence of the state of polarization lower than 0,1 dB (±), within the operational wavelength bandwidth of the OFA. Its dynamic range shall exceed the range of reflectance to be measured.
- d) *Optical spectrum analyzer*: Its linearity and accuracy of spectral-power-measurement shall be better than ±1,5 dB and ±1 dB respectively, within the operational wavelength bandwidth of the OFA. Polarization dependence of the spectral power measurement shall be better than ±0,1 dB (±). The spectral resolution shall be equal to or better than 0,1 nm. A dynamic range exceeding the range of reflectance to be measured is required.
- e) *Optical isolator*: Its optical isolation shall be better than 60 dB (±). The reflectance from this device shall be lower than -60 dB (±) at input port.
- f) *Variable optical attenuator*: Its attenuation range and accuracy shall be over 40 dB (±) and better than ±0,1 dB (±), respectively. The reflectance from this device shall be smaller than -50 dB (±) at each port. The polarization dependence of the insertion loss of this device shall be better than ±0,1 dB (±).

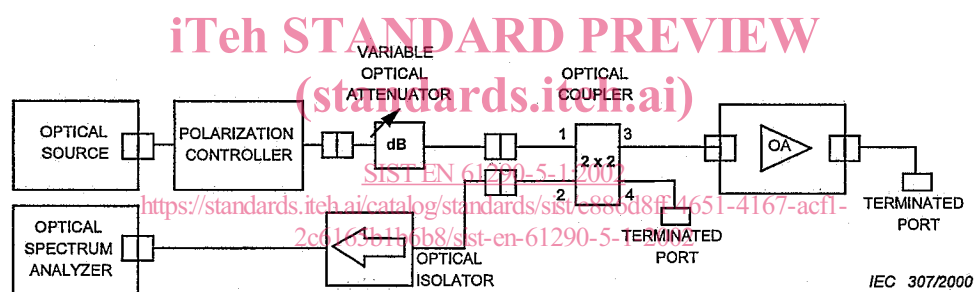


Figure 1 – Typical arrangement of the optical spectrum analyzer test apparatus for input reflectance

- g) *Optical fibre jumpers*: The mode field diameter of the used optical fibre jumpers should be as close as possible to that of fibres used as input and output ports of the OFA. Their reflectance shall be lower than -40 dB (±) at each port, and the length of the jumper shall be shorter than 2 m. If the jumper is connected directly to the OFA, the connector shall have the same characteristics as that of the OFA port.
- h) *Optical connectors*: The connection loss repeatability of the optical connectors shall be better than ±0,2 dB. Their reflectance shall be lower than -60 dB (±).
- i) *Terminated ports*: The reflectance from terminated ports shall be lower than -60 dB.
- j) *Polarization controller*: This device shall be able to convert any state of polarization of a signal to any other state of polarization. The polarization controller may consist of an all fibre polarization controller or a quarter-wave plate rotatable by a minimum of 90° followed by a half-wave plate rotatable by a minimum of 180°. The reflectance of this device shall be smaller than -50 dB (±) at each port. The change in insertion loss of this device shall be less than 0,1 dB (±).



## 4 Test sample

The OFA shall operate at nominal specified operating conditions. Care shall be taken in maintaining the state of polarization of the input light during the measurement.

NOTE Because of the intrinsic gain of the device, the reflectance at each port of the OFA may depend on the optical gain, and consequently on signal and pump power.

## 5 Procedure

### 5.1 Maximum and minimum input reflectance

This method permits determination of the OFA input reflectance with the use of an optical coupler and an optical isolator whose insertion loss is previously measured. In order to have a correct determination of the input reflectance, the contribution of the reverse ASE power,  $P_{ASE}$  at the signal wavelength, shall be discriminated and appropriately subtracted. The measurement procedures described below shall be followed.

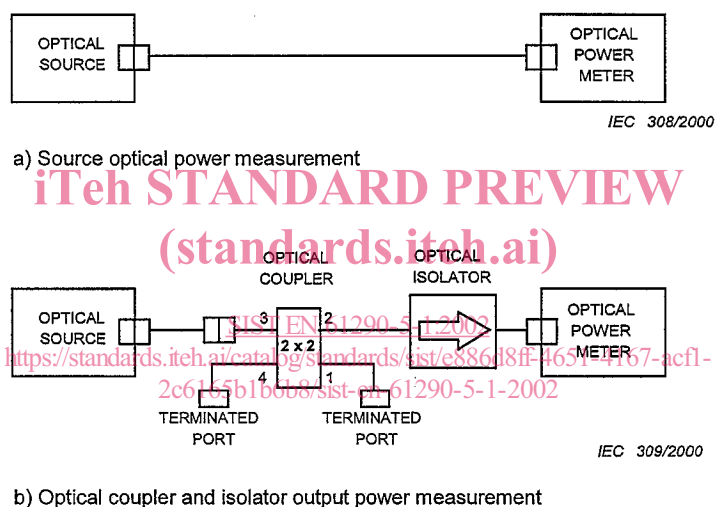


Figure 2 – Set-up for insertion loss measurement of optical coupler and isolator