



# INTERNATIONAL STANDARD

---

**Optical amplifiers – Test methods –  
Part 1-1: Power and gain parameters – Optical spectrum analyzer method**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 33.180.30

ISBN 978-2-8322-2669-8

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD .....	3
1 Scope .....	5
2 Normative references .....	5
3 Terms, definitions and abbreviations .....	5
3.1 Terms and definitions.....	5
3.2 Abbreviations .....	5
4 Apparatus .....	6
5 Test sample.....	8
6 Procedure.....	8
7 Calculation .....	9
8 Test results .....	11
Bibliography.....	12
 Figure 1 – Typical arrangement of the optical spectrum analyzer test apparatus for gain and power measurements .....	 6

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### OPTICAL AMPLIFIERS – TEST METHODS –

#### Part 1-1: Power and gain parameters – Optical spectrum analyzer method

#### 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.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61290-1-1 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition published in 2006 and constitutes a technical revision.

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

- a) updates on the characteristics of measurement apparatus;
- b) revised list of addressed optical amplifier parameters.

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

FDIS	Report on voting
86C/1309/FDIS	86C/1328/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.

This standard shall be used in conjunction with IEC 61290-1 and IEC 61291-1.

A list of all parts of the IEC 61290 series, published under the general title *Optical amplifiers – Test methods*<sup>1</sup> 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

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

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

---

<sup>1</sup> The first editions of some of these parts were published under the general title *Optical fibre amplifiers – Basic specification* or *Optical amplifier test methods*.

## OPTICAL AMPLIFIERS – TEST METHODS –

### Part 1-1: Power and gain parameters – Optical spectrum analyzer method

#### 1 Scope

This part of IEC 61290 applies to all commercially available optical amplifiers (OAs) and optically amplified modules. It applies to OAs using optically pumped fibres (OFAs based on either rare-earth doped fibres or on the Raman effect), semiconductor OAs (SOAs) and planar optical waveguide amplifiers (POWAs).

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 OA parameters, as defined in IEC 61291-1:

- a) nominal output signal power;
- b) gain;
- c) polarization-dependent gain;
- d) maximum output signal power;
- e) maximum total output power.

NOTE All numerical values followed by (±) are suggested values for which the measurement is assured.

The object of this standard is specifically directed to single-channel amplifiers. For multichannel amplifiers, one should refer to the IEC 61290-10 series [1]<sup>2</sup>.

#### 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 61290-1, *Optical amplifiers - Test methods - Part 1: Power and gain parameters*

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

---

<sup>2</sup> Numbers in square brackets refer to the Bibliography