

# SLOVENSKI STANDARD

## SIST EN IEC 61290-4-3:2018

01-september-2018

Nadomešča:

SIST EN 61290-4-3:2016

---

**Optični ojačevalniki - Preskusne metode - 4-3. del: Električni parametri ojačenja - Enokanalni optični ojačevalniki za izhodno krmiljenje moči (IEC 61290-4-3:2018)**

Optical amplifiers - Test methods - Part 4-3: Power transient parameters - Single channel optical amplifiers in output power control (IEC 61290-4-3:2018)

Optische Verstärker - Prüfverfahren - Teil 4-3: Leistungs-Transientenkenngößen von Ein-Kanal-LWL-Verstärkern mit Ausgangs-Leistungskontrolle (IEC 61290-4-3:2018)

Amplificateurs optiques - Méthodes d'essai - Partie 4-3: Paramètres de puissance transitoire - Contrôle de la puissance de sortie des amplificateurs optiques monocanaux (IEC 61290-4-3:2018)

**Ta slovenski standard je istoveten z: EN IEC 61290-4-3:2018**

---

**ICS:**

33.180.30      Optični ojačevalniki      Optic amplifiers

**SIST EN IEC 61290-4-3:2018**      en

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN IEC 61290-4-3:2018](#)

<https://standards.iteh.ai/catalog/standards/sist/5fd4d516-39c6-4d50-9d35-cd1ea3eda42d/sist-en-iec-61290-4-3-2018>

EUROPEAN STANDARD

**EN IEC 61290-4-3**

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2018

ICS 33.180.30

Supersedes EN 61290-4-3:2015

English Version

**Optical amplifiers - Test methods - Part 4-3: Power transient parameters - Single channel optical amplifiers in output power control  
(IEC 61290-4-3:2018)**

Amplificateurs optiques - Méthodes d'essai - Partie 4-3:  
Paramètres de puissance transitoire - Amplificateurs  
optiques monocanaux commandés par la puissance de  
sortie  
(IEC 61290-4-3:2018)

Optische Verstärker - Prüfverfahren - Teil 4-3: Leistungs-  
Transientenkenngößen von Ein-Kanal-LWL-Verstärkern  
mit Ausgangs-Leistungskontrolle  
(IEC 61290-4-3:2018)

This European Standard was approved by CENELEC on 2018-06-01. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

**EN IEC 61290-4-3:2018 (E)****European foreword**

The text of document 86C/1505/FDIS, future edition 2 of IEC 61290-4-3, prepared by subcommittee 86C: "Fibre optic systems and active devices", of IEC/TC 86: "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61290-4-3:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-03-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-06-01

This document supersedes EN 61290-4-3:2015.

This edition constitutes a technical revision, including the following technical change with respect to the previous 2015 edition: alignment of the measurement of amplified spontaneous emission (ASE) relative to signal power with definition given in EN 61290-3-3.

This European Standard is to be used in conjunction with EN 61291-1:2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

(standards.iteh.ai)

**Endorsement notice**

SIST EN IEC 61290-4-3:2018

The text of the International Standard IEC 61290-4-3:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61290-3-3	NOTE	Harmonized as EN 61290-3-3.
IEC 61290-4-1	NOTE	Harmonized as EN 61290-4-1.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61291-1	-	Optical amplifiers - Part 1: Generic specification	EN IEC 61291-1	-

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 61290-4-3:2018](https://standards.iteh.ai/catalog/standards/sist/5fd4d516-39c6-4d50-9d35-cd1ea3eda42d/sist-en-iec-61290-4-3-2018)

<https://standards.iteh.ai/catalog/standards/sist/5fd4d516-39c6-4d50-9d35-cd1ea3eda42d/sist-en-iec-61290-4-3-2018>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN IEC 61290-4-3:2018](https://standards.iteh.ai/catalog/standards/sist/5fd4d516-39c6-4d50-9d35-cd1ea3eda42d/sist-en-iec-61290-4-3-2018)

<https://standards.iteh.ai/catalog/standards/sist/5fd4d516-39c6-4d50-9d35-cd1ea3eda42d/sist-en-iec-61290-4-3-2018>



# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Optical amplifiers – Test methods –  
Part 4-3: Power transient parameters – Single channel optical amplifiers in  
output power control**

**Amplificateurs optiques – Méthodes d'essai –  
Partie 4-3: Paramètres de puissance transitoire – Amplificateurs optiques  
monocanaux commandés par la puissance de sortie**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 33.180.30

ISBN 978-2-8322-5639-8

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references .....	5
3 Terms, definitions and abbreviated terms .....	6
3.1 Terms and definitions.....	6
3.2 Abbreviated terms.....	7
4 Apparatus.....	8
4.1 Test set-up .....	8
4.2 Characteristics of test equipment.....	8
5 Test sample.....	9
6 Procedure.....	9
6.1 Test preparation.....	9
6.2 Test.....	10
7 Calculations.....	10
8 Test results .....	11
8.1 Test setting conditions .....	11
8.2 Test data .....	12
Annex A (informative) Overview of power transient events in single channel EDFA.....	13
A.1 Background.....	13
A.2 Characteristic input power behaviour .....	13
A.3 Parameters for characterizing transient behaviour .....	16
Annex B (informative) Background on power transient phenomena in a single channel EDFA.....	17
B.1 Amplifier chains in optical networks .....	17
B.2 Typical optical amplifier design .....	17
B.3 Approaches to address detection errors .....	19
Annex C (informative) Slew rate effect on transient gain response .....	23
Bibliography.....	24
Figure 1 – Power transient test set-up.....	8
Figure 2 – OA output power transient response of a) input power increase and b) decrease.....	11
Figure A.1 – Example OA input power transient cases for a receiver application.....	14
Figure A.2 – Input power measurement parameters .....	15
Figure A.3 – OA output power transient response .....	16
Figure B.1 – Transient response to input power drop .....	21
Figure B.2 – Transient response to input power rise .....	22
Table 1 – Template for transient control measurement test conditions .....	10



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**OPTICAL AMPLIFIERS – TEST METHODS –****Part 4-3: Power transient parameters –  
Single channel optical amplifiers in output power control**

## 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 61290-4-3 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical change with respect to the previous edition: alignment of the measure of amplified spontaneous emission (ASE) relative to signal power with the definition in IEC 61290-3-3.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
86C/1505/FDIS	86C/1512/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This International Standard is to be used in conjunction with IEC 61291-1:2012.

A list of all parts of the IEC 61290 series, published under the general title *Optical amplifiers – Test methods*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

**ITeH STANDARD PREVIEW**  
(standards.iteh.ai)

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## OPTICAL AMPLIFIERS – TEST METHODS –

### Part 4-3: Power transient parameters – Single channel optical amplifiers in output power control

#### 1 Scope

This part of IEC 61290 applies to output power controlled optically amplified, elementary sub-systems. It applies to optical fibre amplifiers (OFAs) using active fibres containing rare-earth dopants, presently commercially available, as indicated in IEC 61291-1, as well as alternative optical amplifiers that can be used for single channel output power controlled operation, such as semiconductor optical amplifiers (SOAs).

The object of this document is to provide the general background for optical amplifiers (OAs) power transients and their measurements and to indicate those IEC standard test methods for accurate and reliable measurements of the following transient parameters:

- a) transient power response;
- b) transient power overcompensation response;
- c) steady-state power offset;
- d) transient power response time.

The stimulus and responses behaviours under consideration include the following:

- 1) channel power increase (step transient);
- 2) channel power reduction (inverse step transient);
- 3) channel power increase/reduction (pulse transient);
- 4) channel power reduction/increase (inverse pulse transient);
- 5) channel power increase/reduction/increase (lightning bolt transient);
- 6) channel power reduction/increase/reduction (inverse lightning bolt transient).

These parameters have been included to provide a complete description of the transient behaviour of an output power transient controlled OA. The test definitions defined here are applicable if the amplifier is an OFA or an alternative OA. However, the description in Annex A concentrates on the physical performance of an OFA and provides a detailed description of the behaviour of an OFA; it does not give a similar description of other OA types. Annex B provides a detailed description background of the dynamic phenomenon in output power controlled amplifiers under transient conditions and Annex C details the impact of speed of transient inputs.

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61291-1, *Optical amplifiers – Part 1: Generic specification*

### 3 Terms, definitions and abbreviated terms

#### 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

##### 3.1.1

##### **input signal**

optical signal that is input to the OA

##### 3.1.2

##### **input power excursion**

relative input power difference before, during and after the input power stimulus event that causes an OA transient power excursion

Note 1 to entry: Input power excursion is expressed in dB.

##### 3.1.3

##### **input power rise time**

time it takes for the input optical signal to rise from 10 % to 90 % of the total difference between the initial and final signal levels during an increasing power excursion event

Note 1 to entry: See Figure A.2 a).

##### 3.1.4

##### **input power fall time**

time it takes for the input optical signal to fall from 90 % to 10 % of the total difference between the initial and final signal levels during a decreasing power excursion event

Note 1 to entry: See Figure A.2 b).

##### 3.1.5

##### **slew rate**

maximum rate of change of the input optical signal during a power excursion event

Note 1 to entry: See Annex C.

##### 3.1.6

##### **transient power response**

maximum or minimum deviation (overshoot or undershoot) between the OA's target power and the observed power excursion induced by a change in an input channel power excursion

Note 1 to entry: Once the output power of an amplified channel deviates from its target power, the control electronics in the OA should attempt to compensate for the power difference or transient power response, bringing the OA output power back to its original target level.

Note 2 to entry: Transient power response is expressed in dB.

##### 3.1.7

##### **transient power response time**

amount of time taken to restore the power of the OA to a stable power level close to the target power level

Note 1 to entry: This parameter is measured from the time when the stimulus event created the power fluctuation to the time at which the OA power response is stable and within specification.