

INTERNATIONAL  
STANDARD  
NORME  
INTERNATIONALE

IEC  
CEI

61291-2

Second edition  
Deuxième édition  
2007-04

---

---

**Optical amplifiers –**

**Part 2:  
Digital applications –  
Performance specification template**

**Amplificateurs optiques –**

**Partie 2:  
Applications numériques –  
Modèles de spécifications de fonctionnement**

<https://standards.iteh.ai/en/standards/iec/2/ab5730-d989-4e7d-808c-df2e2c485496/iec-61291-2-2007>



Reference number  
Numéro de référence  
IEC/CEI 61291-2:2007



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2007 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Customer Service Centre: [www.iec.ch/webstore/custserv](http://www.iec.ch/webstore/custserv)

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00

### A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: [www.iec.ch/searchpub/cur\\_fut-f.htm](http://www.iec.ch/searchpub/cur_fut-f.htm)

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Service Clients: [www.iec.ch/webstore/custserv/custserv\\_entry-f.htm](http://www.iec.ch/webstore/custserv/custserv_entry-f.htm)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tél.: +41 22 919 02 11  
Fax: +41 22 919 03 00

**INTERNATIONAL  
STANDARD  
NORME  
INTERNATIONALE**

**IEC  
CEI**

**61291-2**

Second edition  
Deuxième édition  
2007-04

---

---

**Optical amplifiers –**

**Part 2:  
Digital applications –  
Performance specification template**

**Amplificateurs optiques –**

**Partie 2:  
Applications numériques –  
Modèles de spécifications de fonctionnement**

<https://standards.iteh.ai/catalog/standards-iec/2/a65730-d989-4e7d-808c-df2e2c485496/iec-61291-2-2007>



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE  
CODE PRIX

**L**

*For price, see current catalogue  
Pour prix, voir catalogue en vigueur*

## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope and object.....	6
2 Normative references.....	6
3 Definitions and abbreviated terms .....	6
3.1 Definitions .....	6
3.2 Abbreviated terms .....	6
4 Product specification worksheet for power amplifiers.....	7
5 Product specification worksheet for pre-amplifiers.....	8
6 Product specification worksheet for line amplifiers.....	9
7 Electromagnetic compatibility (EMC) requirements .....	10
Bibliography.....	11
Table 1 – Minimum list of relevant parameters of power amplifiers to be specified for digital applications.....	7
Table 2 – Minimum list of relevant parameters of pre-amplifiers to be specified for digital applications.....	8
Table 3 – Minimum list of relevant parameters of line amplifiers to be specified for digital applications.....	9

IEC 61291-2:2007

<https://standards.iteh.ai/catalog/standards/iec/21ab5730-d989-4e7d-808c-df2e2c485496/iec-61291-2-2007>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## OPTICAL AMPLIFIERS –

**Part 2: Digital applications –  
Performance specification template**

## 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, 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. 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) 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 unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 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) 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 61291-2 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 2000 and constitutes a technical revision. The main significant changes are the following:

- a) the applicability has been extended to all commercially available optical amplifiers, not just optical fibre amplifiers;
- b) Clause 7, EMC has been added;
- c) references to applicable test methods have been updated.

This standard shall be used in conjunction with IEC 61291-1. It was established on the basis of the second (2006) edition of that standard.

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

CDV	Report on voting
86C/728/CDV	86C/743/RVC

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.

A list of all parts of the IEC 61291 series, published under the general title *Optical amplifiers* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site 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.

Withd  
iTech Standards  
(<https://standards.iteh.ai>)  
Document Preview  
IEC 61291-2:2007  
<https://standards.iteh.ai/catalog/standards/iec/2/a65730-d989-4e7d-808c-df2e2c485496/iec-61291-2-2007>

## INTRODUCTION

This International Standard is devoted to the subject of optical amplifiers. The technology of optical amplifiers is still rapidly evolving, hence amendments and new additions to this standard can be expected.

Withdrawing

iTech Standards  
(<https://standards.itih.ai>)  
Document Preview

<https://standards.itih.ai/standards/iec/2/a65730-d989-4e7d-808c-df2e2c485496/iec-61291-2-2007>

# OPTICAL AMPLIFIERS –

## Part 2: Digital applications – Performance specification template

### 1 Scope and object

This performance specification template applies to optical amplifier (OA) devices to be used in digital applications.

The object of this performance specification template is to provide a frame for the preparation of detail specifications on the performances of OA devices to be used in digital applications.

Detail specification writers may add specification parameters and/or groups of specification parameters for particular applications. However, detail specification writers may not remove specification parameters specified in this standard.

### 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 61290 (all parts), *Optical amplifiers – Test methods*

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

IEC 61291-5-2, *Optical amplifiers – Part 5-2: Qualification specifications – Reliability qualification for optical fibre amplifiers*

IEC 60825-1:1993, *Safety of laser products – Part 1: Equipment classification, requirements and user's guide*

### 3 Terms, definitions and abbreviated terms

#### 3.1 Terms and definitions

For the purpose of this document, the terms and definitions of IEC 61291-1 apply. Possible supplementary definitions specific to OAs for digital applications may be given in detail specifications.

#### 3.2 Abbreviated terms

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, the following is a list of all abbreviations used in this standard:

OA	Optical amplifier
EMC	Electromagnetic compatibility
ESD	Electrostatic discharge



#### 4 Product specification worksheet for power amplifiers

The following worksheet contains a minimum list of specification parameters to be included in detail specifications of OA devices to be used as power amplifiers in digital applications, together with their specification criteria (that is in terms of maximum value, minimum value or both) and the indication of the corresponding standard test method.

**Table 1 – Minimum list of relevant parameters of power amplifiers to be specified for digital applications**

	Parameters	Unit	Minimum value	Maximum value	IEC Reference	
<b>Transmission characteristics</b>	Input power range	dBm			IEC 61290-1 series	
	Output power range	dBm			IEC 61290-1 series	
	Power wavelength band	nm			IEC 61290-1 series	
	Gain	dB			IEC 61290-1 series	
	Signal-spontaneous noise figure	dB	NA <sup>a</sup>		IEC 61290-3 series	
	Polarization dependent gain	dB	NA		IEC 61290-1 series	
	Reverse amplified spontaneous emission power level	dBm	NA		IEC 61290-3 series	
	Input reflectance	dB	NA		IEC 61290-5 series	
	Maximum reflectance tolerable at input	dB	NA		IEC 61290-5 series	
	Maximum reflectance tolerable at output	dB	NA		IEC 61290-5 series	
	Pump leakage to input	dBm	NA		IEC 61290-6 series	
	Pump leakage to output	dBm	NA		IEC 61290-6 series	
	Maximum total output power	dBm	NA		IEC 61290-1 series	
<b>Environmental reliability and safety parameters</b>	Safety laser classification		NA	NA	IEC 60825-1	
	Operating temperature	° C			IEC 61291-5-2	
	Maximum operating relative humidity	%	NA		IEC 61291-5-2	
	Maximum operating vibration severity	Range of frequencies	Hz			IEC 61291-5-2
		Amplitude peak-to-peak	mm	NA		IEC 61291-5-2
	Storage temperature	° C			IEC 61291-5-2	
	Maximum storage relative humidity	%	NA		IEC 61291-5-2	
	Maximum shock severity, free drop	Drop height	mm			IEC 61291-5-2
Failure rate		FIT	NA		IEC 61291-5-2	

<sup>a</sup> NA: not applicable.

## 5 Product specification worksheet for pre-amplifiers

The following worksheet contains a minimum list of specification parameters to be included in detail specifications of OA devices to be used as pre-amplifiers in digital applications, together with their specification criteria (that is in terms of maximum value, minimum value or both) and the indication of the corresponding standard test method.

**Table 2 – Minimum list of relevant parameters of pre-amplifiers to be specified for digital applications**

	Parameters	Unit	Minimum value	Maximum value	IEC Reference	
<b>Transmission characteristics</b>	Input power range	dBm			IEC 61290-1 series	
	Output power range	dBm			IEC 61290-1 series	
	Wavelength band	nm			IEC 61290-1 series	
	Available signal wavelength band	nm			IEC 61290-1 series	
	Gain	dB			IEC 61290-1 series	
	Signal-spontaneous noise figure	dB	NA		IEC 61290-3 series	
	Polarization dependent gain	dB	NA		IEC 61290-1 series	
	Forward amplified spontaneous emission power level	dBm	NA		IEC 61290-3 series	
	Reverse amplified spontaneous emission power level	dBm	NA		IEC 61290-3 series	
	Input reflectance	dB	NA		IEC 61290-5 series	
	Maximum reflectance tolerable at input	dB	NA		IEC 61290-5 series	
	Maximum reflectance tolerable at output	dB	NA		IEC 61290-5 series	
	Pump leakage to input	dBm	NA		IEC 61290-6 series	
	Pump leakage to output	dBm	NA		IEC 61290-6 series	
	Maximum total output power	dBm	NA		IEC 61290-1 series	
<b>Environmental and safety parameters</b>	Safety laser classification		NA	NA	IEC 60825-1	
	Operating temperature	° C			IEC 61291-5-2	
	Maximum operating relative humidity	%	NA		IEC 61291-5-2	
	Maximum operating vibration severity	Range of frequencies	Hz			IEC 61291-5-2
		Amplitude peak-to-peak	mm	NA		IEC 61291-5-2
	Storage temperature	° C			IEC 61291-5-2	
	Maximum storage relative humidity	%	NA		IEC 61291-5-2	
	Maximum shock severity, free drop	Drop height	mm			IEC 61291-5-2