

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

**Amplificateurs optiques –
Partie 2: Applications numériques – Modèle de spécifications de performances**

<https://standards.iech.org/standards/sst/5/4/53cce-1e4f-4fb9-b01b-e02e7bb07543/iec-61291-2-2012>

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL AMPLIFIERS –

Part 2: Digital applications –
Performance specification template

FOREWORD

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International Standard IEC 61291-2 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

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

CDV	Report on voting
86C/1018/CDV	86C/1039/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 third edition cancels and replaces the second edition published in 2007 and constitutes a minor update through clarification that the scope is for single channel optical amplifiers, and that pump leakage parameters do not apply to semiconductor optical amplifiers.

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

The committee has decided that the contents of this publication will remain unchanged until the stability 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- withdrawn,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.

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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. Each abbreviation introduced in this international standard is generally explained in the text the first time it appears. However, for an easier understanding of the whole text, a list of all abbreviations used in this international standard is given in Clause 3.

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OPTICAL AMPLIFIERS –

Part 2: Digital applications – Performance specification template

1 Scope and object

This performance specification template applies to single channel optical amplifier (OA) devices to be used in digital applications. For multichannel applications, use IEC 61291, Part 4.

The object of this performance specification template is to provide a frame for the preparation of detail specifications on the performances of single channel 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 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 60825-1:1993, *Safety of laser products – Part 1: Equipment classification and requirements*

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 Guide 107, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 61291-1 apply.

NOTE Possible supplementary definitions specific to OAs for digital applications may be given in detail specifications.

3.2 Abbreviated terms

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 single channel 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	
Transmission characteristics	Input power range	dBm			IEC 61290-1 series	
	Output power range	dBm			IEC 61290-1 series	
	Wavelength band	nm			IEC 61290-1 series	
	Gain	dB			IEC 61290-1 series	
	Signal-spontaneous noise figure	dB	NA ^a		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 ^b	dBm	NA		IEC 61290-6 series	
	Pump leakage to output ^b	dBm	NA		IEC 61290-6 series	
	Maximum total output power	dBm	NA		IEC 61290-1 series	
Environmental reliability and safety parameters	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		

^a NA: not applicable
^b Not applicable to semiconductor optical amplifiers

5 Product specification worksheet for pre-amplifiers

The following worksheet contains a minimum list of specification parameters to be included in detail specifications of single channel 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	
Transmission characteristics	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 ^a	dBm	NA		IEC 61290-6 series	
	Pump leakage to output ^a	dBm	NA		IEC 61290-6 series	
	Maximum total output power	dBm	NA		IEC 61290-1 series	
Environmental and safety parameters	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

^a Not applicable to semiconductor optical amplifiers

6 Product specification worksheet for line amplifiers

The following worksheet contains a minimum list of specification parameters to be included in detail specifications of single channel OA devices to be used as line 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 3 – Minimum list of relevant parameters of line amplifiers to be specified for digital applications

	Parameters	Unit	Minimum value	Maximum value	IEC Reference	
Transmission characteristics	Input power range	dBm			IEC 61290-1 series	
	Output power range	dBm			IEC 61290-1 series	
	Saturation output power	dBm	NA		IEC 61290-1 series	
	Wavelength band	nm			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 ^a	dBm	NA		IEC 61290-6 series	
	Pump leakage to output ^a	dBm	NA		IEC 61290-6 series	
	Maximum total output power	dBm	NA		IEC 61290-1 series	
	Polarization mode dispersion	ps	NA		IEC 62290-11 series	
Environmental and safety parameters	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

^a Not applicable to semiconductor optical amplifiers