

INTERNATIONAL STANDARD

CONSOLIDATED VERSION

**Optical amplifiers -
Part 5-2: Qualification specifications - Reliability qualification for optical fibre
amplifiers**



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IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Optical amplifiers -
Part 5-2: Qualification specifications -
Reliability qualification for optical fibre amplifiers**

FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61291-5-2 edition 2.1 contains the second edition (2017-01) [documents 86C/1376/CDV and 86C/1426/RVC], its corrigendum 1 (2019-05) and its amendment 1 (2026-02) [documents 86C/2005/FDIS and 86C/2010/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61291-5-2 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 2002. It constitutes a technical revision.

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

- a) removal of the contents on the relating quality management system from scope, terms and definitions, and the reliability requirements;
- b) moving fit-rate calculation to Annex B (informative);
- c) change of requirements for shock test;
- d) amendment of abbreviations related to changes a) and b).

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

CDV	Report on voting
86C/1376/CDV	86C/1426/RVC

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.

A list of all parts in 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 document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

1 Scope

This part of IEC 61291 applies to optical amplifiers (OAs) and optically amplified, elementary sub-systems for terrestrial applications, using active fibres (optical fibre amplifiers (OFAs)) containing rare-earth dopants, which are commercially available.

The black box approach is used in this document. The black box approach is adopted in order to give product specifications which are independent of OA implementation details. For reliability qualification purposes, some information about the internal components is needed; these internal parts are themselves treated as black boxes. This document gives requirements for the evaluation of OA reliability by combining the reliability of such internal black boxes.

The object of this document is to specify the minimum list of reliability qualification tests, requirements on failure criteria during testing and on reliability predictions, and give the relevant normative references to establish a standard method for the assessment of the reliability of OFA devices and sub-systems in order to minimize risks and to promote product development and reliability qualification.

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 60050-731, *International Electrotechnical Vocabulary – Chapter 731: Optical fibre communication*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-21, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-31, *Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

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

IEC 61300-2-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-4: Tests – Fibre/cable retention*

IEC 62005-9-1, *Fibre optic interconnecting devices and passive components – Reliability – Part 9-1: Qualification of passive optical components*

IEC 62005-9-2, *Reliability of fibre optic interconnecting devices and passive optical components – Part 9-2: Reliability qualification for single fibre optic connector sets – Single mode*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61291-1, IEC 60050-731 and the following 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 failure

non-compliance to product specification or change in parameters as agreed by the customer and supplier

3.1.2 OFA manufacturer OFAM

manufacturer who provides optical fibre amplifier (OFA) devices or subsystems meeting the requirements of the applicable product specification (PS)

Note 1 to entry PS includes the reliability requirement.

3.2 Abbreviated terms

EDFF	erbium doped fluoride fibre
EDSFA	erbium doped silica fibre amplifier
EDTF	erbium doped tellurite fibre
FIT	failure in time
FFS	for further study
OA	optical amplifier
OFA	optical fibre amplifier
OFAM	optical amplifier manufacturer
OFAM	optical fibre amplifier manufacturer
PDFF	praseodymium doped fluoride fibre
PS	product specification
RH	relative humidity
DFF	thulium doped fluoride fibre
UCL	upper confidence level

4 Reliability requirements

4.1 Tests

4.1.1 General

An optical fibre amplifier (OFA) device or sub-system is an assembly of various parts and components of different nature. A main point in the reliability testing of the OFA device or sub-system is to ensure the reliability of each part and basic manufacturing process used and to