

INTERNATIONAL STANDARD

**Fibre optic interconnecting devices and passive components – Performance standard –
Part 056-2: Single mode fibre pigtailed style optical fuse for category C –
Controlled environment**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**FIBRE OPTIC INTERCONNECTING DEVICES
AND PASSIVE COMPONENTS –
PERFORMANCE STANDARD –**

**Part 056-2: Single mode fibre pigtailed
style optical fuse for category C –
Controlled environment**

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.
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International Standard IEC 61753-056-2 has been prepared by subcommittee SC86B: Fibre optic interconnecting devices and passive components, of IEC technical committee TC86: Fibre optics.

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

FDIS	Report on voting
86B/3500/FDIS	86B/3544/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.

A list of all parts in the IEC 61753 series, published under the general title *Fibre optic interconnecting devices and passive components – Performance standard*, 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 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.

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

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INTRODUCTION

- 1) The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning optical fuse.

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

KiloLambda technologies, Ltd.
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ISO (www.iso.org/patents) and IEC (<http://patents.iec.ch>) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult these data bases for the most up-to-date information concerning patents.

US patent US-7162,114 B2, "Optical Energy switching device and method", granted January 9, 2007.

Japan patent 4376632, "Optical Energy switching device and method", granted September 18, 2009.

- 2) The optical fuse is a passive device, designed to protect equipment and fibre cables from damage due to optical overpower, spikes and surges. The optical fuse produces a controlled, permanent, signal blocking at a predetermined power threshold in an optical fibre transmission line. The optical fuse is wavelength independent over its entire specified spectral range. IEC 60869-1 contains generic information on optical fuses. The optical fuse has a maximum allowed power input $P_{in\ max}$. Beyond this power it is dysfunctional and can let light through. Numerical values for $P_{in\ max}$ are given in Annex B.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 056-2: Single mode fibre pigtailed style optical fuse for category C – Controlled environment

1 Scope

This part of IEC 61753 contains the minimum initial test and measurement requirements and severities which a fibre optical fuse satisfies in order for it to be categorised as meeting the requirements of single mode fibre pigtailed style optical fuse used in controlled environments. Optical performance specified in this document relates to in-line type configurations fuses only.

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 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60869-1, *Fibre optic interconnecting devices and passive components – Fibre optic passive power control devices – Part 1: Generic specification*¹

IEC 61300-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 1: General and guidance*

IEC 61300-2-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-1: Tests – Vibration (sinusoidal)*

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

IEC 61300-2-9, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-9: Tests – Shock*

IEC 61300-2-14, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-14: Tests – High optical power*¹

IEC 61300-2-17, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-17: Tests – Cold*

IEC 61300-2-18, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-18: Tests – Dry heat – High temperature endurance*

¹ To be published.

IEC 61300-2-19, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-19: Tests – Damp heat (steady state)*

IEC 61300-2-22, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-22: Tests – Change of temperature*

IEC 61300-2-42, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-42: Tests – Static side load for connectors*

IEC 61300-2-44, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-44: Tests – Flexing of the strain relief of fibre optic devices*

IEC 61300-3-2, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-2: Examinations and measurements – Polarization dependent loss in a single-mode fibre optic device*

IEC 61300-3-3, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-3: Examinations and measurements – Active monitoring of changes in attenuation and return loss*

IEC 61300-3-7, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-7: Examinations and measurements – Wavelength dependence of attenuation and return loss of single mode components*

IEC 61300-3-32, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-32: Examinations and measurements – Polarization mode dispersion measurement for passive optical components*

3 Tests

<https://www.iec.ch/standards/iec-61753-056-2-2012>
All test methods are in accordance with the IEC 61300 series.

All tests are to be carried out to validate performance over the required operating wavelength and power range. As a result, single or multiple spectral bands may be chosen for the qualification in addition to threshold power.

4 Test reports

Fully documented test reports and supporting evidence shall be prepared and shall be available for inspection as evidence that the tests have been carried out and complied with.

5 Performance requirements

5.1 Sample size, sequencing and grouping

Sample sizes for the tests are defined in Annex A.

5.2 Dimensions

Dimensions shall comply with either an appropriate IEC interface standard or with those given in appropriate manufacturers' drawings, where the IEC interface standard does not exist or cannot be used.

5.3 Test details and requirements

Table 1 specifies the optical environmental and mechanical performance requirements and test methods for optical fuses pertaining to this standard.

Compliance to this standard requires demonstration of the ability to meet the performance requirement in Table 1.

Table 1 – Performance requirements for optical fuses (1 of 6)

No.	Tests	Requirements	Details	
1	Insertion loss	Operating wavelength range: 1 520 nm to 1 625 nm Insertion loss ≤ 1,5 dB Insertion loss is measured with input power ≤ -5 dBm	Method: Launch patchcord length: Launch conditions: Source power stability: Wavelength range: Total uncertainty	IEC 61300-3-7, test sample configuration according to Method B2.1 ≥ 2 m. Only the fundamental mode shall propagate at the fuse interface and at the detector. The wavelength of the source shall be longer than cut-off wavelength of the fibre. Less than or equal or equal ± 0,05 dB over the measuring period or at least 1 h 1 520 nm to 1 625 nm ≤ ± 0,05 dB
2	Return loss below power threshold	≥ 35 dB Grade T ≥ 40 dB Grade R ≥ 50 dB Grade U ≥ 60 dB Grade V Return loss is measured with input power ≤ -5 dBm	Method: Source: Total uncertainty	IEC 61300-3-7 measurement, Method 1 OCWR for grades T, R, U IEC 61300-3-7, measurement method 1 OFDR for grade V LD 1 520 nm and 1 625 nm Test every sample with the two wavelengths. ≤± 2 dB
3	Return loss above power threshold, after fuse response	≥ 30 dB Return loss is measured with input power ≤ -5 dBm	Method: Source: Total uncertainty	IEC 61300-3-7, measurement method 1 OCWR LD 1 520 nm and 1 625 nm Test every sample with the two wavelengths. ≤ ± 2 dB
4	Polarization dependent loss	≤0,2 dB Over the specified operating wavelength range The samples shall be terminated onto single-mode fibres as per IEC 60793-2-50, Type B 1.1, in either coated fibres (primary and secondary) or reinforced cable format	Method: Optical source Wavelength: Total uncertainty:	IEC 61300-3-2, all polarization methods 1 550 nm ± 10 nm ≤ ± 0,05 dB over the dynamic range to be measured
5	Polarization mode dispersion	≤ 0,2 ps Over the specified operating wavelength range	Method: Optical source Wavelength: Total uncertainty:	IEC 61300-3-32, MPS method 1 550 nm ± 10 nm ≤ ± 0,05 dB over the dynamic range to be measured