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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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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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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.

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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- withdrawn,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.

INTRODUCTION

 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:

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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.

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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 specification¹

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 613000-2-4, 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 power¹

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.

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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

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.

No.	Tests	Requirements		Details
1	Insertion loss	Operating wavelength range: 1 520 nm to1 625 nm	Method:	IEC 61300-3-7, test sample configuration according to Method B2.1
		Insertion loss ≤ 1,5 dB Insertion loss is measured with input power ≤ -5 dBm	Launch patchcord length:	\geq 2 m. Only the fundamental mode shall propagate at the fuse interface and at the detector.
			Launch conditions:	The wavelength of the source shall be longer than cut-off wavelength of the fibre.
			Source power stability:	Less than or equal or equal \pm 0,05 dB over the measuring period or at least 1 h
			Wavelength range:	1 520 nm to 1 625 nm
			Total uncertainty	$\leq \pm 0,05 \text{ dB}$
2	Return loss below power	\ge 35 dB Grade T	Method:	IEC 61300-3-7 measurement, Method 1 OCWR for grades T,R, U
	threshold	\ge 40 dB Grade R		IEC 61300-3-7, measurement method 1
		≥ 50 dB Grade U		OFDR for grade V
		≥ 60 dB Grade V	Source:	LD 1 520 nm and 1 625 nm
		Return loss is measured with input power ≤ -5 dBm		Test every sample with the two wavelengths.
			Total uncertainty	≤± 2 dB
3	Return loss above power	≥ 30 dB Return loss is measured with	Method:	IEC 61300-3-7, measurement method 1 OCWR
	threshold, after fuse response	input power ≤ –5 dBm	Source:	LD 1 520 nm and 1 625 nm Test every sample with the two wavelengths.
			Total uncertainty	$\leq \pm 2 \text{ dB}$
4	Polarization	≤0,2 dB	Method:	IEC 61300-3-2, all polarization methods
	dependent loss	Over the specified operating wavelength range	Optical source Wavelength:	1 550 nm ± 10 nm
		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	Total uncertainty:	$\leq \pm$ 0,05 dB over the dynamic range to be measured
5	Polarization	≤ 0,2 ps	Method:	IEC 61300-3-32, MPS method
	mode dispersion	Over the specified operating wavelength range	Optical source Wavelength:	1 550 nm ± 10 nm
			Total uncertainty:	$\leq \pm$ 0,05 dB over the dynamic range to be measured

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

ParticipationThe fuse will meet the power threshold requirements as specified when operated at the 3 specified temperaturesis measured accordingly. Samples from every batch will be destructively tested, all will comply.Optical source Wavelength:Optical source Wavelength:1 550 nm10 °C ± 2 °C 25 °C ± 2 °C 60 °C ± 2 °C25 °C ± 2 °C 60 °C ± 2 °C9Blocking attenuation at threshold>30 dB The fuse will meet theMethod:See Annex D for detailed test description. The test power input is 1 to 3 dB above						
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9 Blocking attenuation at threshold (destructive test) >30 dB Method: Test temperature: 10 °C ± 2 °C (25 °C ± 2 °C (60 °C ± 2 °C (60 °C ± 2 °C (70 °C ± 2 °C ± 10))))))))))))))))))						
9Blocking attenuation at threshold (destructive test)>30 dB The fuse will meet the requirement as specified, when operated at the 3 specified temperatures for the specified durationMethod:See Annex D for detailed test description. The test power input is 1 to 3 dB above power threshold and the blocking attenuation is measured accordingly. Samples from every batch will be destructively tested, all will comply.0ptical source Wavelength: Test duration:0ptical source 96 h at test power 10 °C \pm 2 °C 25 °C \pm 2 °C					1 550 nm	
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the specified duration Samples from every batch will be destructively tested, all will comply. Optical source Wavelength: 1 550 nm Test duration: 96 h at test power Test temperature: 10 °C ± 2 °C 25 °C ± 2 °C 25 °C ± 2 °C		attenuation at threshold	attenuation at hreshold The fuse will meet the requirement as specified,		power threshold and the blocking attenuation	
Wavelength: Test duration: 96 h at test power Test temperature: 10 °C ± 2 °C 25 °C ± 2 °C		test)				
Test temperature: 10 °C ± 2 °C 25 °C ± 2 °C					1 550 nm	
25 °C ± 2 °C				Test duration:	96 h at test power	
				Test temperature:	10 °C ± 2 °C	
60 °C ± 2 °C					25 °C ± 2 °C	
					60 °C ± 2 °C	

Table 1 (2 of 6)

No.	Tests	Requirements		Details
10	Response time	<100 μs	Method:	See Annex D for detailed test description.
		The fuse will meet the requirement as specified, when operated at the 3		The test power input is 1 dB to 3 dB above power threshold and the blocking attenuation is measured accordingly.
		specified temperatures		Samples from every batch will be destructively tested, all will comply.
			Optical source Wavelength:	1 550 nm
			Test temperature:	10 °C ± 2 °C
				25 °C ± 2 °C
				60 °C ± 2 °C
11	Damp heat	By the end of the test the	Method:	IEC 61300-2-19
	return loss shall meet the requirements of test 2 The insertion loss change during the test shall be within \pm 0,5 dB of the init value. Insertion loss is	requirements of test 1 By the end of the test the		During the test the change in Insertion loss shall be measured by test method IEC 61300-3-3.
		The insertion loss change	Pre conditioning procedure:	Standard atmospheric conditions as defined in IEC 61300-1 for 2 h
			Temperature:	+ 40 ± 2 °C
		within \pm 0,5 dB of the initial value. Insertion loss is measured with input power	Relative humidity:	93 % ⁺² ₋₃ RH
		≤ –5 dBm After the test the power	Duration of exposure:	96 h
			Specimen optically functioning:	Yes
			Optical source Wavelength:	1 550 nm
			Optical power:	3 dB lower than power threshold, as defined in Annex B
			Recovery procedure:	Allow specimens to return to standard atmospheric conditions defined in IEC 61300-1 in 2 h.

Table 1 (3 of 6)

NI -	Tarta	Demuinemente	Deteile			
No.	Tests	Requirements		Details		
12	Change of temperature		Method:	IEC 61300-2-22 During the test the change in Insertion loss shall be measured by test method IEC 61300-3-3.		
		return loss shall meet the requirements of test 2	Pre conditioning procedure:	Standard atmospheric conditions as defined in IEC 61300-1 for 2 h		
		The insertion loss change during the test shall be	High temperature:	+ 60 ± 2 °C		
		within \pm 0,5 dB of the initial value. Insertion loss is	Low temperature:	-10 ± 2 °C		
		measured with input power ≤ −5 dBm After the test the power	Duration at extreme temperature:	1 h		
		threshold shall meet the requirements of test 8	Temperature rate of change:	1 °C/min		
			Number of cycles:	5		
			Specimen optically functioning:	Yes		
			Maximum sampling interval during the test:	15 min		
			Optical source Wavelength:	1 550 nm		
			Optical power:	3 dB lower than power threshold, as defined in Annex B		
			Recovery procedure:	Allow specimens to return to standard atmospheric conditions defined in IEC 61300-1 in 2 h.		
13	Dry heat-high	emperature enduranceinsertion loss shall meet the requirements of test 1By the end of the test the return loss shall meet the requirements of test 2The insertion loss change during the test shall be within \pm 0,5 dB of the initial value. Insertion loss is measured with input power	Method:	IEC 61300-2-18		
	endurance requirements of te By the end of the return loss shall m requirements of te The insertion loss during the test sha within \pm 0,5 dB of value. Insertion lo measured with inp \leq -5 dBm After the test the p threshold shall me			During the test the change in insertion loss shall be measured by test method IEC 61300-3-3.		
			Pre conditioning procedure:	Standard atmospheric conditions as defined in IEC 61300-1 for 2 h		
			High temperature:	+ 60 ± 2 °C		
			Duration at extreme temperature:	96 h		
		After the test the power threshold shall meet the	Specimen optically functioning:	Yes		
		requirements of test 8	Optical source Wavelength:	1 550 nm		
			Optical power:	3 dB lower than power threshold, as defined in Annex B		
			Recovery procedure:	Allow specimens to return to standard atmospheric conditions defined in IEC 61300-1 in 2 h.		

Table 1 (4 of 6)

	_					
No.	Tests	Requirements		Details		
14	insertic require By the return I require The ins during	By the end of the test the insertion loss shall meet the requirements of test 1 By the end of the test the	Method:	IEC 61300-2-17. During the test the change in insertion loss shall be measured by test method IEC 61300-3-3.		
		return loss shall meet the requirements of test 2	Pre conditioning procedure:	Standard atmospheric conditions as defined in IEC 61300-1 for 2 h		
		The insertion loss change during the test shall be	Low temperature:	-10 ± 2 °C		
		within \pm 0,5 dB of the initial value. Insertion loss is measured with input power \leq -5 dBm	Duration at extreme	96 h		
			temperature:			
		After the test the power threshold shall meet the	Specimen optically functioning:	Yes		
		requirements of test 8	Optical source Wavelength:	1 550 nm		
			Optical power:	3 dB lower than power threshold, as defined in Annex B		
			Maximum sampling interval during the test:	1 h		
			Recovery procedure:	Allow specimens to return to standard atmospheric conditions defined in IEC 61300-1 in 2 h.		
15	Vibration	After the test the insertion loss shall meet the requirements of test 1 After the test the return loss shall meet the requirements of test 2	Method:	IEC 61300-2-1		
	(Sinusoidal)			During the test the change in insertion loss shall be measured by test method IEC 61300-3-3.		
			Frequency range:	10 – 55 Hz		
		The insertion loss change during the test shall be within ± 0.5 dB of the initial	Vibration	0,75 mm		
			amplitude: Number of cycles:	15		
			Rate of change:	1 octave/min		
		\leq -5 dBm	Number of axes:	3 orthogonal axes		
		After the test the power threshold shall meet the requirements of test 8	Specimen optically functioning:	No		
			Optical power:	3 dB lower than power threshold, as defined in Annex B		
			Optical source Wavelength	1 550 nm		
16	Shock	hock After the test the insertion loss shall meet the requirements of test 1	Method:	IEC 61300-2-9		
			Acceleration force:	500 g		
		After the test the return loss	Number of axes:	3 axes, 2 directions		
		shall meet the requirements of test 2	Number of cycles:	2 shocks per direction, 12 shocks total		
		After the test the power	Duration per axis:	Nominal 1 ms duration, half sine pulse		
	threshold shall meet the requirements of test 8		Measurements required:	Before, after each axis, and after the test		
			Specimen optically functioning:	No		
			Optical source Wavelength	1 550 nm		
			Optical power:	3 dB lower than power threshold, as defined in Annex B		

Table 1 (5 of 6)

No.	Tests	Requirements		Details
17	Static side	After the test the insertion	Method:	IEC 61300-2-42
	load ¹	loss shall meet the requirements of test 1	Magnitude of the	1 N for 1 h for reinforced cable
		After the test the return loss	load:	0,2 N for 5 min for secondary coated fibres
		shall meet the requirements of test 2	Rate of load application:	0,5 N/s
		Above measurements carried out in power ≤ −5 dBm	Load application point:	0,3 m from the end of the device and two mutually perpendicular directions as permitted by the product design
			Specimen optically functioning:	No
			Optical source Wavelength:	1 550 nm
18	Fibre/cable	By the end of the test the	Method:	IEC 61300-2-4.
	retention	insertion loss shall meet the requirements of test 1	Magnitude of the	
		By the end of the test the	load:	10 N \pm 1 N at 5 N/s for reinforced cables
		return loss shall meet the requirements of test 2		5,0 N \pm 0,5 N at 0,5 N/s for secondary coated fibres
		The insertion loss change during the test shall be within ± 0,5 dB of the initial value. Insertion loss is measured with input power ≤ -5 dBm		2,0 N \pm 0,2 N at 0,5 N/s for primary coated fibres
			Load application point:	0,3 m from point where the fibre/cable exits from the specimen
		-5 0.611	Duration of the	120 s duration at 10 N
			load:	60 s duration at 2 N or 5 N
			Method of mounting:	The sample shall be rigidly mounted such that the load is only applied to the fibre/cable retention mechanism.
			Specimen optically functioning:	Yes
			Optical source Wavelength:	1 550 nm
			Optical power:	3 dB lower than power threshold, as defined in Annex B
19	Optical fibre cable flexing	After the test the insertion loss shall meet the requirements of test 1	Method:	IEC 61300-2-44
	After the test the return loss shall meet the requirements of test 2	After the test the return loss shall meet the requirements	Magnitude of the load:	2 N for reinforced cable
			Angle of deflection per cycle:	± 90°
			Number of cycles:	30
			Specimen optically functioning:	No
			Method of mounting:	The sample shall be rigidly mounted such that the load is only applied to the fibre/cable.

Table 1 (6 of 6)

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Annex A

(normative)

Sample size and product sourcing requirements

Table A.1 gives sample size and product sourcing requirements.

Table A.1 – Sample size and product sourcing requirements

No.	Test	Sample size	Source
N/A	Dimensional	10	New
1	Insertion loss	80	New
2	Return loss below power threshold (against two fusion splices)	80	Test 1
3	Return loss above power threshold (against two fusion splices)	12	Test 8 or 9
4	Polarization dependent loss	4	Test 2
5	Polarization mode dispersion	4	Test 4
6	High optical power. Below power threshold	4	Test 5
7	High optical power. Above power threshold	4	Test 2
8	Power threshold, (destructive test)	12	Test 2
	4 samples at each temperature		
9	Blocking attenuation at threshold, (destructive test)	12	Test 2
10	Response time, (destructive test)	12	Test 2
11	Damp heat (steady state)	4	Test 2
12	Change of temperature	4	Test 2
13	High temperature endurance	4	Test 2
14	Cold	4	Test 2
15	Vibration (sinusoidal)	4	Test 2
16	Shock	4	Test 2
17	Static side load	4	Test 2
18	Fibre/cable retention	4	Test 2
19	Optical fibre cable flexing	4	Test 2

NOTE Tests 5 to 19 may be performed at any order. Samples for tests 5 to 18 should be randomly selected from the samples of tests 2 and 4. Some tests are destructive and the samples cannot be used for any further testing. Tests 8 and 9 are performed on the same samples or on different samples.

Annex B

(normative)

Power thresholds for optical fuses

Table B.1 gives powers for optical fuses, single-mode.

Power threshold	Recommended power for normal CW work dBm	Maximum allowed power input, P _{in max} dBm		
ubiii	dBm	QBIII		
18	Up to 15	Up to 36		
19	Up to 16	Up to 36		
20	Up to 17	Up to 36		
21	Up to 18	Up to 36		
22	Up to 19	Up to 36		
23	Up to 20	Up to 36		
24	Up to 21	Up to 36		
25	Up to 22	Up to 36		
26	Up to 23	Up to 36		
27	Up to 24	Up to 36		
28	Up to 25	Up to 36		
29	Up to 26	Up to 36		
30	Up to 27	Up to 36		
NOTE $P_{\text{in max}}$ of 36 dBm is the maximum allowed power input into an optical fuses having power threshold up to 30 dBm. Beyond this power it is dysfunctional and can let light through.				

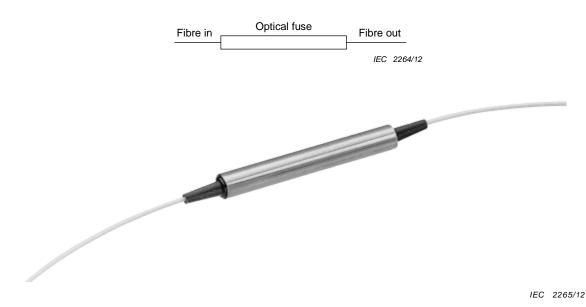
Table B.1 – Powers for optical fuses, single-mode

Annex C (informative)

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Example of dimensions for optical fuses

The optical fuse configurations are shown in Figure C.1.



NOTE Typical dimensions are 6 mm diameter and 50 mm length.

Figure C.1 – Optical fuse, in-line configuration, regularly without connectors

Annex D

(normative)

Testing of optical fuses²

D.1 Introductory remark

Testing of the optical fuse functionality and measuring its parameters are described in this Annex. Testing of the following parameters, which do not appear in regular IEC standards, is described:

- power threshold;
- blocking attenuation at threshold;
- response time.

The fuse is a safety device and only destructive testing can test its functionality; it is not functional any more after exposure to powers over the threshold. The actual test requires high power, and needs a dedicated test setup, designed for these measurements.

An example of a test carried out on an optical fuse will be given in this Annex, where the optical fuse parameters are

-	power threshold: (each fuse in the batch)	20 dBm \pm 1dB;
-	blocking attenuation at threshold	>30 dB;
_	response time:	<100 µs.

D.2 Power threshold and blocking attenuation at threshold measurement

Measuring the threshold power is the first and most important functional test of the optical fuse, calling to expose the rated e.g. 20 dBm optical fuse to slowly varying powers starting at 10 dBm and up to 36 dBm. The powers needed call for an oscillator (e.g. diode laser) followed by fibre amplifiers, as demonstrated in Figure D.1.

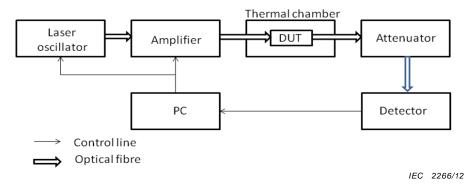


Figure D.1 – Test set-up schematics

The power measured by the detector, as a function of input power, is providing both, the threshold power as well as the blocking attenuation at threshold of the DUT. The insertion loss for low and high power is provided as well.

² This Annex will be deleted when an IEC standard for a test method for an optical fuse is published.

Figure D.2 shows a curve of the change of the IL against the P_{in} . The change of the IL that occurs at threshold can be seen, the IL change from ~0 dB to >50 dB, giving more than five orders of magnitude "protection", or blocking attenuation at threshold, being > 30 dB needed in this example. The values of the insertion loss before and after activation are part of the collected results.

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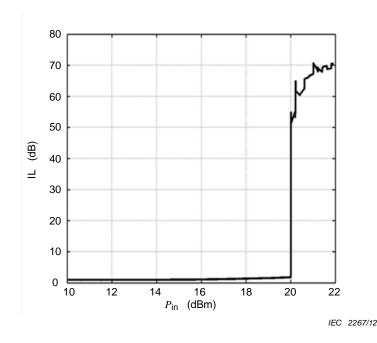
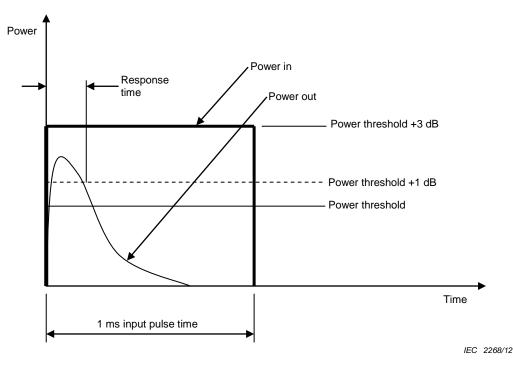


Figure D.2 – Example of power threshold and blocking attenuation at threshold measurements for sample 1280A of an optical fuse

D.3 Response time measurement

The response time of the optical fuse is defined as the total time where the optical fuse output power level is higher than the predetermined optical fuse power threshold by + 1 dB. Here the input pulse duration is 1 ms long, having a rise time of ~10 μ s and a steady state power of fuse power threshold + 3 dB. Figure D.3 illustrates the parameters.

In this case, rise time is the elapsed time for input power to reach 90 % of its steady-state value from the time it starts.



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Figure D.3 – Response time curve of an optical fuse

Schematics of the test set-up and description are shown in Figure D.4:

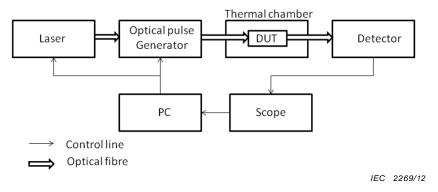


Figure D.4 – Response time testing set-up

A 1 550 nm wavelength laser provides the input signal, which is amplified and regenerated by the optical pulse generator unit, controlled by a designated software program. Output power is measured and presented graphically using an oscilloscope. Analysis of the data is carried out using standard mathematical software.

Since the test is carried out at three different temperatures, the minimal specified temperature, the maximal specified temperature and the average specified temperature of the optical fuse. The DUT is placed in a thermal chamber having a stable temperature as required.

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