IEC 61753-041-2

Edition 1.0 2014-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Fibre optic interconnecting devices and passive components – Performance standard –
Part 041-2: Non-connectorized single-mode OTDR reflecting device for category C – Controlled environment

Dispositifs d'interconnexion et composants passifs à fibres optiques – Norme de performance –
Partie 041-2: Dispositif de réflexion pour OTDR unimodal non connectorisé pour la catégorie C – Environnement contrôlé

IEC 61753-041-2:2014-05(en-fr)

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International Standard IEC 61753-041-2 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components of IEC technical committee 86: Fibre optics.

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

FDIS	Report on voting
86B/3750/FDIS	86B/3778/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.

The French version of this standard has not been voted upon.

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

A list of all parts of IEC 61753 series, under the general title *Fibre optic interconnecting devices and passive components performance standards*, can be found on the IEC website.

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 041-2: Non-connectorized single-mode OTDR reflecting device for category C – Controlled environment

1 Scope

This part of IEC 61753 contains the minimum initial performance, test and measurement requirements and severities which a fibre optic non-connectorized OTDR reflecting device for monitoring point to point (PTP) or point to multipoint (PTMP) passive optical networks (PON) using an optical time-domain reflectometer (OTDR) should satisfy in order to be categorized as meeting the requirements of category C (controlled environments), as defined in Annex A of IEC 61753-1:2007.

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 61300 (all parts), *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*

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: Tests – 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*

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*

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: Examination and measurements – Polarization dependent loss in a single-mode fibre optic device*

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

IEC 61753-1:2007, *Fibre optic interconnecting devices and passive components performance standard – Part 1: General and guidance for performance*

IEC 62074-1, *Fibre optic WDM devices – Part 1: Generic specification*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions, as well as those given in IEC 62074-1, apply.

3.1.1
OTDR reflecting device
wavelength-selective reflecting device having two ports that light from the signal wavelength ranges transmits from the first port to the second port and OTDR light from the OTDR wavelength range launched into one port is (partly) reflected back to that launch port

Note 1 to entry: Annex B of this standard provides information concerning the function of the OTDR reflecting device.

3.1.2
Type A of OTDR reflecting device
OTDR reflecting device with low attenuation

Note 1 to entry: Examples are shown in Figures B.2, B.5, B.6, B.7 and B.8 of Annex B.

3.1.3
Type B of OTDR reflecting device
OTDR reflecting device with higher attenuation

Note 1 to entry: Examples are shown in Figures B.3 and B.4 of Annex B.

3.2 Abbreviations

Abbreviations in order of appearance:

OTDR: Optical time-domain reflectometer
PTP: Point to point
PTMP: Point to multipoint
PON: Passive optical network
GPON: Gigabit-capable passive optical network
PMD: Physical media dependent
CSMA: Carrier sense multiple access
CD: Collision detection
CO: Central office
NWBD: Non-wavelength-selective branching device
HRD: High reflection device
WDM: Wavelength division multiplexer
FBG: Fibre bragg grating
TFF: Thin film filter

4 Test

Unless otherwise specified, all test methods are in accordance with the IEC 61300 series. Each test defines the number of samples to be evaluated. The samples used for each test are intended to be previously unstressed new samples but may also be selected from previously used samples if desired. The samples shall be terminated onto single-mode fibres as per IEC 60793-2-50 category B 1.1, B 1.3 or B 6 in either coated fibres (primary and secondary) or reinforced cable format. All measurements shall be carried out at atmosphere conditions defined in IEC 61300-1, unless otherwise stated.

All tests shall be carried out over the operating wavelength range listed below:

1) Signal wavelength ranges:
   1 260 nm to 1 360 nm;
   1 480 nm to 1 500 nm;
   1 550 nm to 1 560 nm.
2) OTDR wavelength ranges:
   1 620 nm to 1 630 nm;
   1 645 nm to 1 655 nm;

unless otherwise specified.

NOTE 1 310 nm, 1 490 nm and 1 550 nm are the nominal or centre wavelengths, stated for the ranges 1 260 nm to 1 360 nm, 1 480 nm to 1 500 nm and 1 550 nm to 1 560 nm as defined in ITU-T Recommendations G.983.3 and G.984.2 and IEEE 802.3ah-2004.

5 Test report

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

6 Performance requirements

6.1 Reference components

The testing for these components does not require the use of reference components.

6.2 Dimensions

Dimensions shall comply with those given in appropriate manufacturer's drawings.

6.3 Sample size

Sample sizes for the tests are defined in Annex A.

6.4 Test details and requirements

Table 1 – Test details and requirements *(1 of 5)*

No.	Test	Requirement	Details	
1	Attenuation (insertion loss) IEC 61300-3-7	Type A: ≤ 0,5 dB Type B: ≤ 1,0 dB Attenuation (insertion loss) shall be met over the operating wavelength range	Launch patch cord length: Polarization state of light source: Launch conditions: Measurement uncertainty:	≥ 2 m Unpolarized The wavelength of the source shall be longer than cut-off wavelength of the fibre. Test results shall be obtained under measurement uncertainty of ± 0,1 dB
2	Wavelength Isolation IEC 61300-3-7	≥ 20 dB between signal wavelength ranges and OTDR wavelength range	Launch patch cord length: Polarization state of light source: Launch conditions: Measurement uncertainty:	≥ 2 m Unpolarized The wavelength of the source shall be longer than cut-off wavelength of the fibre Test results shall be obtained under measurement uncertainty of ± 1 dB
3	Return loss IEC 61300-3-7	Grade S1: ≥ 26 dB for signal wavelength range(s) for both input and output ports and ≤ 10 dB for OTDR wavelength range for input port only. Grade S2: ≥ 26 dB for operating signal range(s) for both input and output ports and ≤ 1,5 dB for OTDR wavelength range for input port only. Grade T1: ≥ 35 dB for signal wavelength range(s) for both input and output ports and ≤ 5 dB for OTDR wavelength range for input port only. Grade T2: ≥ 35 dB for signal wavelength range(s) for both input and output ports and ≤ 0,5 dB for OTDR wavelength range for input port only	Source type: Measurement uncertainty: Other requirements:	Laser diode (LD) Test results shall be obtained under measurement uncertainty of ± 0,05 dB for RL < 0,5 dB, of ± 0,2 dB for RL < 1,5 dB, of ± 0,5 dB for RL < 5 dB, of ± 1 dB for RL ≥ 5 dB. All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement

Table 1 *(2 of 5)*

No.	Test	Requirement	Details	
4	Polarization dependent loss (PDL) IEC 61300-3-2	≤ 0,2 dB Polarization dependent loss shall be met over the operating wavelength range	Launch patch cord length: Source type: Test wavelengths: Measurement uncertainty:	≥ 2 m Laser diode (LD) 1 310 nm ± 20 nm 1 550 nm ± 20 nm Test results shall be obtained under measurement uncertainty of ± 0,05 dB
5	High optical power IEC 61300-2-14	≥ 300mW (sum of power at the wavelength ranges at the same time) During and on completion of the test the insertion loss limits of test No. 1 shall be met After the test the wavelength isolation limits of test No. 2 shall be met During and on completion of the test the return loss limits of test No. 3 shall be met	Source type Max. power to be applied at wavelength ranges 1 550 nm to 1 560 nm and 1 620 nm to 1 630 nm (1 645 nm to 1 655 nm): Max. power to be applied at wavelength ranges 1 480 nm to 1 500 nm and 1 260 nm to 1 360 nm: Measurement uncertainty:	Laser diode (LD) 300 mW (+ ~25 dBm) 10 mW (+ 10 dBm) Test results shall be obtained under insertion loss measurement uncertainty of ± 0,1 dB. Test results shall be obtained under return loss measurement uncertainty of ± 0,05 dB for RL < 0,5 dB, of ± 0,2 dB for RL < 1,5 dB, of ± 0,5 dB for RL < 5 dB, of ± 1 dB for RL ≥ 5dB
6	Cold IEC 61300-2-17	After the test the insertion loss limits of test No. 1 shall be met. In addition the change of insertion loss during the test shall be within ± 0,3 dB from the initial value. After the test the wavelength isolation limits of test No. 2 shall be met. During and on completion of the test the return loss limits of test No. 3 shall be met	Temperature: Duration of the exposure: Maximum sampling interval during the test: Measurements required:	–10 °C ± 2 °C 96 h 1 h Insertion loss shall be measured before, during and after the test. Return loss shall be measured before, during and after the test

Table 1 *(3 of 5)*

No.	Test	Requirement	Details	
7	Dry heat – High temperature endurance IEC 61300-2-18	After the test the insertion loss limits of test No. 1 shall be met In addition the change of insertion loss during the test shall be within ± 0,3 dB from the initial value After the test the wavelength isolation limits of test No. 2 shall be met During and on completion of the test the return loss limits of test No. 3 shall be met	Temperature: Duration of the exposure: Maximum sampling interval during the test: Measurements required:	+ 60 °C ± 2 °C 96 h 1 h Insertion loss shall be measured before, during and after the test. Return loss shall be measured before, during and after the test
8	Change of temperature IEC 61300-2-22	After the test the insertion loss limits of test No. 1 shall be met In addition the change of insertion loss during the test shall be within ± 0,3 dB from the initial value After the test the wavelength isolation limits of test No. 2 shall be met During and on completion of the test the return loss limits of test No. 3 shall be met	High temperature: Low temperature: Number of cycles: Rate of temperature change: Duration at extreme temperatures: Maximum sampling interval during the test: Measurements required:	+ 60 °C ± 2 °C –10 °C ± 2 °C 5 1 °C/min 1 h 10 min Insertion loss shall be measured before, during and after the test. Return loss shall be measured before, during and after the test
9	Damp heat (steady state) IEC 61300-2-19	After the test the insertion loss limits of test No. 1 shall be met. In addition the change of insertion loss during the test shall be within ± 0,3 dB from the initial value. After the test the wavelength isolation limits of test No. 2 shall be met. During and on completion of the test the return loss limits of test No. 3 shall be met.	Temperature: Humidity: Duration of the exposure: Maximum sampling interval during the test: Measurements required:	+ 40 °C ± 2 °C 93 % RH + 2 % RH, – 3 % RH 96 h 1 h Insertion loss shall be measured before, during and after the test. Return loss shall be measured before, during and after the test

Table 1 *(4 of 5)*

No.	Test	Requirement	Details	
10	Vibration IEC 61300-2-1	After the test the insertion loss limits of test No. 1 shall be met. After the test the wavelength isolation limits of test No. 2 shall be met. After the test the return loss limits of test No. 3 shall be met	Frequency range: Constant vibration amplitude: Number of cycles (10 Hz – 55 Hz -10 Hz): Frequency change: Number of axes: Measurements required:	10 Hz – 55 Hz 0,75 mm 15 1 octave/min 3 orthogonal Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test
11	Shock IEC 61300-2-9	After the test the insertion loss limits of test No. 1 shall be met. After the test the wavelength isolation limits of test No. 2 shall be met. After the test the return loss limits of test No. 3 shall be met	Acceleration force: Number of axes: Duration shock: Pulse: Number of shocks: Measurements required:	5 000 m/s^2 3 main axes, perpendicular to each other 1 ms Half sine 2 per axis Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test
12	Fibre/cable retention IEC 61300-2-4	After the test the insertion loss limits of test No. 1 shall be met. After the test the wavelength isolation limits of test No. 2 shall be met. After the test the return loss limits of test No. 3 shall be met	Magnitude of the load: Load application point: Load rate: Duration of the load: Measurements required:	10 N ± 1 N for reinforced cable. 5,0 N ± 0,5 N for secondary coated fibre. 2,0 N ± 0,2 N for primary coated fibre. 0,3 m from the end of device. 5 N/s for reinforced cable. 0,5 N/s for coated fibre. 120 s at 10 N 60 s at 5 N and 2 N Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test