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Edition 1.0 2025-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Performance standard –
Part 086-02: Non-connectorized single-mode bidirectional 1490 / 1550 nm downstream and 1310 nm upstream WWDM devices for category C – Indoor controlled environment

Dispositifs d'interconnexion et composants passifs fibroniques - Norme de performance –
Partie 086-02: Dispositifs WWDM unimodaux non connectorisés bidirectionnels 1 490 nm/1 550 nm en voie descendante et 1 310 nm en voie montante pour la catégorie C – Environnement intérieur contrôlé

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 086-02: Non-connectorized single-mode bidirectional 1 490/1 550 nm downstream and 1 310 nm upstream WWDM devices for category C – Indoor controlled environment

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IEC 61753-086-02 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics. It is an International Standard.

This first edition cancels and replaces the first edition of IEC 61753-086-2 published in 2009. This edition constitutes a technical revision.

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

a) Change of test conditions harmonizing with IEC 61753-1: 2018.

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

Draft	Report on voting
86B/4998/FDIS	86B/5023/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 document 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

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 086-02: Non-connectorized single-mode bidirectional 1 490/1 550 nm downstream and 1 310 nm upstream WWDM devices for category C – Indoor controlled environment

1 Scope

This part of IEC 61753 contains the minimum initial performance, test and measurement requirements and severities which a fibre optic pigtailed 1 490/1 550 nm downstream and 1 310 nm upstream wide wavelength division multiplexing (WWDM) passive optical network (PON) device will satisfy in order to be categorized as meeting the requirements of category C (indoor controlled environment), as defined in IEC 61753-1:2018, Annex A. WWDM is defined in IEC 62074-1. Annex B gives general information for these PON WWDM devices.

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

IEC 60794-2-50, *Optical fibre cables – Part 2-50: Indoor cables – Family specification for simplex and duplex cables for use in terminated cable assemblies*

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 or cable retention*

IEC 61300-2-5, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-5: Tests – Torsion*

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*

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

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 strain relief*

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 61300-3-6, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-6: Examination and measurements – Return loss*

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 61300-3-20, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-20: Examinations and measurements – Directivity of fibre optic branching devices*

IEC 61300-3-29, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-29: Examinations and measurements – Spectral transfer characteristics of DWDM devices*

IEC 61753-1:2018, *Fibre optic interconnecting devices and passive components – Performance standard – Part 1: General and guidance*

IEC 62074-1, *Fibre optic interconnecting devices and passive components – Fibre optic WDM devices – Part 1: Generic specification*

IEC TS 62627-09, *Fibre optic interconnecting devices and passive components – Vocabulary for passive optical devices*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62074-1 and IEC TS 62627-09 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

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4 Test

All test methods are in accordance with a specific IEC 61300 series standard, of which parts applicable to this document are mentioned in 6.4 (see Table 2).

The samples shall be terminated onto single-mode fibres as per IEC 60793-2-50 category B-652.B, B-652.D or B-657 in either coated fibres (primary and secondary) or reinforced cable format as per IEC 60794-2-50.

Table 1 is intended to provide guidance on the wavelength ranges of the various spectral bands. It is not intended for specification. All tests shall be carried out over the operating wavelength ranges of 1 260 nm to 1 360 nm, 1 480 nm to 1 500 nm, and 1 550 nm to 1 560 nm, unless otherwise specified.

Table 1 – Single-mode spectral bands

Band	Descriptor	Range nm
O-band	Original	1 260 to 1 360
E-band	Extended	1 360 to 1 460
S-band	Short wavelength	1 460 to 1 530
C-band	Conventional	1 530 to 1 565
L-band	Long wavelength	1 565 to 1 625
U-band	Ultralong wavelength	1 625 to 1 675
Source: ITU-T G-series Recommendations – Supplement 39. NOTE The complete title of the source document can be found in the Bibliography.		

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 performance testing in this document does not require the use of reference components.

6.2 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.

6.3 Sample size

Sample sizes are defined in Table A.1 of Annex A.

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6.4 Test details and requirements

The requirements are given only for pigtailed WWDM devices.

A minimum length of fibre or cable of 2,0 m per port shall be used for all tests. Environmental tests shall be in accordance with IEC 61300-1.

Minimum test details and requirements are shown in Table 2.

Table 2 – Test details and requirements for category C

No.	Test	Requirement	Details	
1	**Centre wavelengths (CWL)** IEC 61300-3-7; IEC 61300-3-29	Centre wavelength: – channel 1: 1 310 nm – channel 2: 1 490 nm – channel 3: 1 555 nm	Launch patchcord length: Source type: Launch conditions: Measurement uncertainty:	≥ 2 m Unpolarised The wavelength of the source shall be longer than cut-off wavelength of the fibre. ≤ 0,05 nm
2	**Passband** IEC 61300-3-7; IEC 61300-3-29	Channel 1: 1 310 nm ± 50 nm Channel 2: 1 490 nm ± 10 nm Channel 3: 1 555 nm ± 5 nm Passband is defined as 0,5 dB bandwidth.	Launch patchcord length: Source type: Launch conditions: Measurement uncertainty:	≥ 2 m Unpolarised broadband light The wavelength of the source shall be longer than cut-off wavelength of the fibre. ≤ 0,05 nm
3	**Attenuation (insertion loss)** IEC 61300-3-7	≤ 0,8 dB Attenuation shall be met over the operating wavelength ranges. NOTE Attenuation is the maximum value of the attenuations within all passbands.	Launch patchcord length: Source type: Launch conditions: Measurement uncertainty:	≥ 2 m Unpolarised The wavelength of the source shall be longer than cut-off wavelength of the fibre. ≤ 0,1 dB
4	**Wavelength isolation** IEC 61300-3-7	≥ 18 dB between wavelength ranges 1 480 nm to 1 500 nm and 1 550 nm to 1 560 nm; ≥ 30 dB between wavelength ranges 1 260 nm to 1 360 nm and 1 550 nm to 1 560 nm Wavelength isolation shall be met over the operating wavelength ranges.	Launch patchcord length: Source type: Launch conditions: Measurement uncertainty:	≥ 2 m Unpolarised The wavelength of the source shall be longer than cut-off wavelength of the fibre. ≤ 0,1 dB

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No.	Test	Requirement	Details	
5	**Directivity** IEC 61300-3-20	≥ 35 dB Grade T ≥ 50 dB Grade U ≥ 60 dB Grade V Directivity shall be met over the operating wavelength ranges.	Launch patchcord length: Source type: Launch conditions: Measurement uncertainty: Other requirements:	≥ 2 m Laser diode (LD) The wavelength of the source shall be longer than cut-off wavelength of the fibre. ≤ 1 dB All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement. The directivity shall be measured between any pair of input or output ports.
6	**Return loss** IEC 61300-3-6	≥ 35 dB Grade T ≥ 40 dB Grade R ≥ 50 dB Grade U ≥ 60 dB Grade V Return loss shall be met over the operating wavelength ranges.	Source type: Measurement uncertainty: Other requirements:	LD ≤ 1 dB All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement. The return loss shall be measured for any of the input or output ports.
7	**Polarization dependent loss (PDL)** IEC 61300-3-2	≤ 0,2 dB PDL shall be met over the operating wavelength ranges.	Launch patchcord length: Source type: Measurement uncertainty:	≥ 2 m LD ≤ 0,05 dB
8	**High optical power** IEC 61300-2-14	During the test the attenuation limits of test No. 3 shall be met. Moreover, during and on completion of the test, the attenuation shall be within ± 0,5 dB of original value under standard atmospheric conditions. On completion of the test the return loss limits of test No. 6 shall be met. On completion of the test the wavelength isolation limits of test No. 4 shall be met.	Temperature: Source type: Max. total optical power to be applied: Wavelength: Test duration: Measurement uncertainty:	+60 °C ± 2 °C LD 300 mW NOTE It is the sum of the input power for all ports. For each port the desired wavelength from test 1 0,5 h attenuation: ≤ 0,1 dB return loss: ≤ 1 dB

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