

INTERNATIONAL STANDARD

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Fibre optic interconnecting devices and passive components – Performance standard –

Part 089-02: Non-connectorised single-mode bidirectional OTDR monitoring WWDM for category C – Indoor controlled environment

[IEC 61753-089-02:2022](#)

Dispositifs d'interconnexion et composants passifs fibroniques – Norme de performance –

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Partie 089-02: WWDM de surveillance par OTDR bidirectionnel unimodal non connectorisé de catégorie C – Environnement intérieur contrôlé





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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC INTERCONNECTING DEVICES AND
PASSIVE COMPONENTS – PERFORMANCE STANDARD –****Part 089-02: Non-connectorised single-mode bidirectional OTDR
monitoring WWDM for category C – Indoor controlled environment**

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IEC 61753-089-02 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 IEC 61753-089-2 published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical change with respect to IEC 61753-089-2:2013: change of test conditions harmonizing with IEC 61753-1:2018.

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

Draft	Report on voting
86B/4626/FDIS	86B/4646/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/standardsdev/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 089-02: Non-connectorised single-mode bidirectional OTDR monitoring WWDM for category C – Indoor controlled environment

1 Scope

This part of IEC 61753 contains the minimum initial test and measurement requirements and severities which a fibre-optic pigtailed wide wavelength division multiplexing (WWDM) device for monitoring passive optical networks (PON) using an optical time-domain reflectometer (OTDR) satisfies in order to be categorised as meeting the requirements of category C (indoor controlled environment), as defined in Annex A of IEC 61753-1:2018. WWDM is defined in IEC 62074-1.

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 61753-089-02:2022](#)

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 61300-2-1, *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*

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: Examinations and measurements – 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 61300-3-20, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-20: Examination and measurements – Directivity of fibre optic branching 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* [61753-089-02:2022](https://standards.iteh.ai/catalog/standards/sist/1b64dadd-b580-4425-a06d-61753-089-02:2022)

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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 the following apply.

ISO and IEC maintain terminological 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>

3.1

OTDR monitoring WWDM device

WWDM device for monitoring that has three ports, common port, optical line terminal (OLT) port and OTDR port

Note 1 to entry: Signal wavelengths are transmitted between the common port and the OLT port. OTDR wavelengths are transmitted between the common port and the OTDR port.

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 signal wavelength ranges of 1 260 nm to 1 360 nm, 1 480 nm to 1 500 nm, 1 550 nm to 1 560 nm, and over the OTDR wavelength range, 1 620 nm to 1 630 nm or 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 Standard 802.3ah™-2004.

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 Supplement 39.		

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.

6.4 Test details and requirements

The requirements are given only for pigtailed WWDM devices. For connectorised components, the connector performances shall be in compliance with IEC 61753-1.

A minimum length of fibre or cable of 2,0 m per port shall be used for all tests.

Minimum test details and requirements are shown in Table 2.

Table 2 – Test details and requirements for category C

No.	Test	Requirement	Details	
1	Insertion loss (attenuation) IEC 61300-3-7	≤ 0,8 dB Insertion loss shall be met between common port and OLT port for the signal wavelength range and between common port and OTDR port for the OTDR wavelength range.	Launch patchcord length:	≥ 2 m
			Source type	Unpolarised
			Launch conditions:	The wavelength of the source shall be longer than cut-off wavelength of the fibre.
			Measurement uncertainty:	0,1 dB
2	Wavelength isolation IEC 61300-3-7	≥ 20 dB Wavelength isolation shall be met between common port and OLT port for the OTDR wavelength range and between common port and OTDR port for the signal wavelength range.	Launch patchcord length:	≥ 2 m
			Source type:	Unpolarised
			Launch conditions:	The wavelength of the source shall be longer than cut-off wavelength of the fibre.
			Measurement uncertainty:	1 dB
3	Directivity IEC 61300-3-20	≥ 50 dB grade U between OLT port and OTDR port. Directivity shall be met over the specified wavelength ranges.	Launch patchcord length:	≥ 2 m
			Source type:	Laser diode (LD)
			Launch conditions:	The wavelength of the source shall be longer than cut-off wavelength of the fibre.
			Measurement uncertainty:	1 dB
			Other requirements:	All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement.
4	Return loss IEC 61300-3-6	≥ 50 dB grade U Return loss shall be met over the specified wavelength ranges.	Launch patchcord length:	≥ 2 m
			Source type:	LD
			Measurement uncertainty:	1 dB
			Other requirements:	All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement.
5	Polarisation dependent loss (PDL) IEC 61300-3-2	≤ 0,2 dB	Launch patchcord length:	≥ 2 m
			Source type:	LD
			Measurement uncertainty:	0,05 dB
6	High optical power IEC 61300-2-14	≥ 300 mW (max. power at the single wavelength on 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. 4 shall be met.	Source type:	LD
			Max. power to be applied at wavelength 1 550 nm and wavelength range 1 620 nm to 1630 nm (1 645 nm to 1 655 nm):	300 mW (+ ~25 dBm)
			Max. power to be applied at wavelength 1 490 nm and 1 310 nm:	10 mW (+ ~10 dBm)
			Temperature:	60 °C ± 2 °C
			Measurement uncertainty:	Insertion loss: 0,1 dB Return loss: 1 dB

No.	Test	Requirement	Details	
7	Cold IEC 61300-2-17	<p>After the test, the insertion loss limits of test no. 1 shall be met. In addition, the insertion loss during the test shall be within $\pm 0,3$ dB from the initial value.</p> <p>After the test, the wavelength isolation limits of test no. 2 shall be met.</p> <p>During and on completion of the test, the return loss limits of test no. 4 shall be met.</p>	Temperature:	$-10\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$
			Duration of the exposure:	96 h
			Maximum sampling interval during the test:	1 h
			Measurements required:	<p>Insertion loss shall be measured before, during and after the test.</p> <p>Return loss shall be measured before, during and after the test.</p>
8	Dry heat IEC 61300-2-18	<p>After the test, the insertion loss limits of test no. 1 shall be met.</p> <p>In addition, the insertion loss during the test shall be within $\pm 0,3$ dB from the initial value. After the test, the wavelength isolation limits of test no. 2 shall be met.</p> <p>During and on completion of the test, the return loss limits of test no. 4 shall be met.</p>	Temperature:	$+60\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$
			Duration of the exposure:	96 h
			Maximum sampling interval during the test:	1 h
			Measurements required:	<p>Insertion loss shall be measured before, during and after the test.</p> <p>Return loss shall be measured before, during and after the test.</p>
9	Change of temperature IEC 61300-2-22	<p>After the test, the insertion loss limits of test no. 1 shall be met. In addition, the insertion loss during the test shall be within $\pm 0,3$ dB from the initial value.</p> <p>After the test, the wavelength isolation limits of test no. 2 shall be met.</p> <p>During and on completion of the test, the return loss limits of test no. 4 shall be met.</p>	High temperature:	$+60\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$
			Low temperature:	$-10\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$
			Number of cycles:	5
			Rate of temperature change:	1 $^{\circ}\text{C}/\text{min}$
			Duration at extreme temperatures:	1 h
			Maximum sampling interval during the test:	0,5 h
			Measurements required:	<p>Insertion loss shall be measured before, during and after the test.</p> <p>Return loss shall be measured before, during and after the test.</p>
10	Damp heat (steady state) IEC 61300-2-19	<p>After the test, the insertion loss limits of test no. 1 shall be met.</p> <p>In addition, the insertion loss during the test shall be within $\pm 0,3$ dB from the initial value.</p> <p>After the test, the wavelength isolation limits of test no. 2 shall be met.</p> <p>During and on completion of the test, the return loss limits of test no. 4 shall be met.</p>	Temperature:	$+40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$
			Humidity:	93 % RH + 2 % RH, -3 % RH
			Duration of the exposure:	96 h
			Maximum sampling interval during the test:	1 h
			Measurements required:	<p>Insertion loss shall be measured before, during and after the test.</p> <p>Return loss shall be measured before, during and after the test.</p>

No.	Test	Requirement	Details	
11	Vibration (sinusoidal) 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. 4 shall be met.	Frequency range:	10 Hz to 55 Hz to 10 Hz
			Amplitude:	0,75 mm
			Number of cycles:	15
			Sweep rate:	1 octave/min
			Number of axes:	3 orthogonal
			Measurements required:	Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test.
12	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. 4 shall be met	Acceleration:	5 000 m/s ²
			Number of axes:	3 main axes, perpendicular on each other
			Duration shock:	1 ms
			Pulse:	Half sine
			Number of shocks:	2 per axis and direction (two in each direction)
			Measurements required:	Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test.
13	Fibre or 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. 4 shall be met.	Magnitude and rate of application:	(10 N ± 1 N) at 5 N/s for reinforced cable (5,0 N ± 0,5 N) at 0,5 N/s for secondary coated fibre (2,0 N ± 0,2 N) at 0,5 N/s for primary coated fibre
			Load application point:	0,3 m from the end of device
			Duration of the load:	60 s
			Measurements required:	Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test.
14	Flexing of the strain relief of fibre optic devices IEC 61300-2-44	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. 4 shall be met.	Tensile force:	2,0 N for 1 h for reinforced cable
			Number of cycles:	50
			Angle:	±90°
			Load application point:	0,3 m from the end of device
			Measurements required:	Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test.