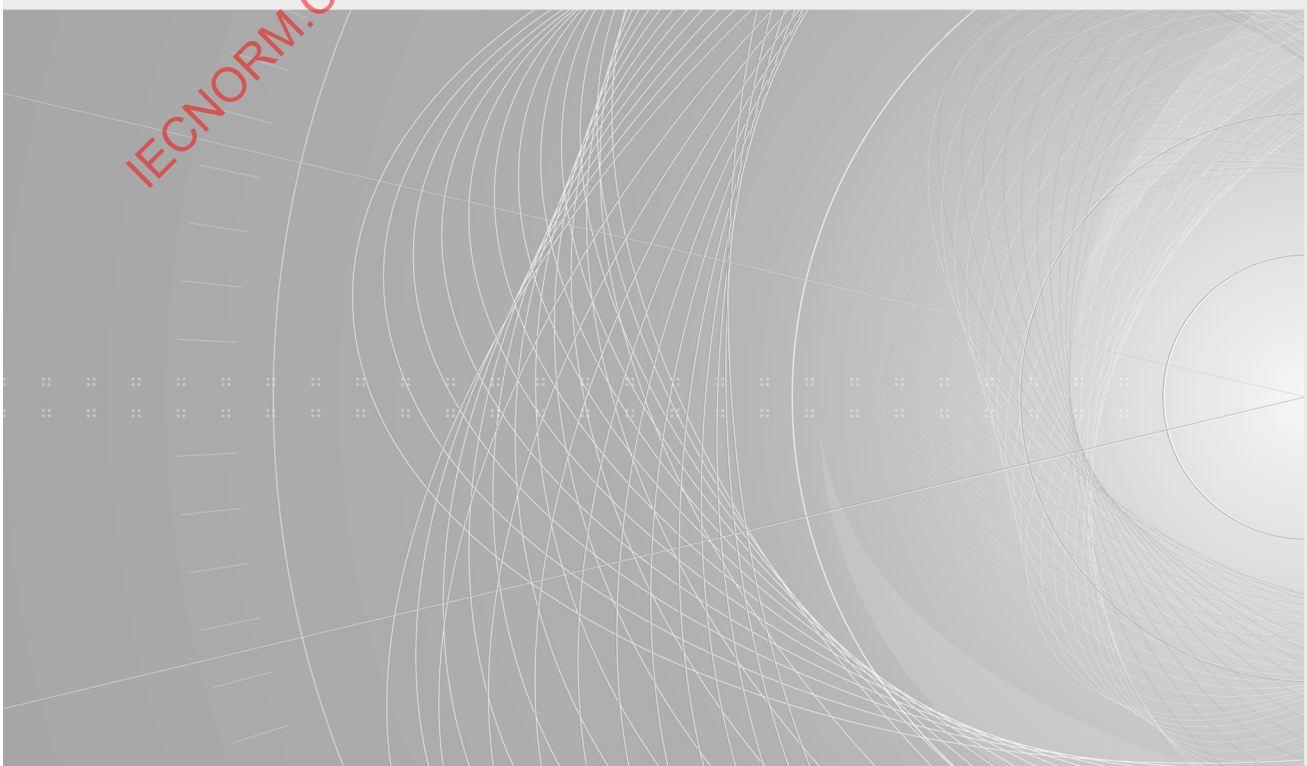
IEC 61753-085-02

Edition 1.0 2021-07

INTERNATIONAL STANDARD

Fibre optic interconnecting devices and passive components – Performance standard –
Part 085-02: Non-connectorized single-mode pigtailed CWDM devices for category C – Indoor controlled environment



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

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FOREWORD

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IEC 61753-085-02 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 61753-085-2 published in 2008. This edition constitutes a technical revision.

This edition includes the following specific technical change with respect to IEC 61753-085-2: 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/4319/CDV	86B/4377B/RVC

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 "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 085-02: Non-connectorized single-mode pigtailed CWDM devices 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 coarse wavelength division multiplexing (CWDM) device 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. CWDM 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 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 – 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 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: Examination and measurements – Wavelength dependence of attenuation and return loss of single mode components*

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 terminological databases for use in standardization at the following addresses:

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

4 Test

All test methods are in accordance with a specific IEC 61300 series standard. The 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 wavelength range defined by the customer's application; wavelengths, the complete CWDM wavelength range or a wider wavelength range such as from 1 250 nm to 1 650 nm may be used. Values of operating wavelength used in performance verification shall be as agreed between the customer and supplier or shall be as defined in the manufacturer's specification.

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 CWDM devices. For connectorized 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	**Centre wavelength (CWL)** IEC 61300-3-7; IEC 61300-3-29	Centre wavelengths[a]: - channel 1: 1 271nm - channel 2: 1 291nm - channel 3: 1 311nm - channel 4: 1 331nm - channel 5: 1 351nm - channel 6: 1 371nm - channel 7: 1 391nm - channel 8: 1 411nm - channel 9: 1 431nm - channel 10: 1 451nm - channel 11: 1 471nm - channel 12: 1 491nm - channel 13: 1 511nm - channel 14: 1 531nm - channel 15: 1 551nm - channel 16: 1 571nm - channel 17: 1 591nm - channel 18: 1 611nm	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:	0,05 nm
2	**Passband** IEC 61300-3-7; IEC 61300-3-29	CWL ±6,5 nm Passband is defined as 0,5 dB bandwidth[b].	Launch patchcord length:	≥ 2 m
			Source type:	Unpolarised broadband light
			Launch conditions:	The wavelength of the source shall be longer than cut-off wavelength of the fibre.
			Measurement uncertainty:	0,05 nm
3	**Insertion loss (attenuation)** IEC 61300-3-7	Type A: ≤ 1,4 dB (1-channel device) ≤ 2,1 dB (4-channel device) ≤ 2,8 dB (8-channel device) ≤ 3,5 dB (12-channel device) ≤ 4,3 dB (16-channel device) ≤ 4,3 dB (18-channel device) Type B: ≤ 1,7 dB (1-channel device) ≤ 2,7 dB (4-channel device) ≤ 4,0 dB (8-channel device) ≤ 5,3 dB (12-channel device) ≤ 6,1 dB (16-channel device) ≤ 6,1 dB (18-channel device) c d	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
4	**Total channel isolation** IEC 61300-3-7; IEC 61300-3-29	≥ 30 dB	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

No.	Test	Requirement	Details	
5	**Passband ripple** IEC 61300-3-7; IEC 61300-3-29	Type A: ≤ 0,3 dB Type B: ≤ 0,5 dB	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:	0,05 dB
6	**Channel non-uniformity** IEC 61300-3-7; IEC 61300-3-29	≤ 1,0 dB (4-channel device) ≤ 1,5 dB (8-channel device) ≤ 2,0 dB (12-channel device) ≤ 2,5 dB (16-channel device) ≤ 2,5 dB (18-channel device)	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
			Other requirements:	Depending on applications, channel non-uniformity may not be required. This needs then to be agreed between the buyer and the supplier.
7	**Out-of-band attenuation** IEC 61300-3-7; IEC 61300-3-29	≥ 20 dB; over the complete wavelength range. (refer to clause 4)	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
8	**Return loss** IEC 61300-3-6	≥ 50 dB grade U; over the complete wavelength range	Source:	LD
			Measurement uncertainty:	1 dB
			Other requirements:	All ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement.[e]
9	**Polarization dependent loss (PDL)** IEC 61300-3-2	≤ 0,2 dB	Launch patchcord length:	≥ 2 m
			Source type:	LD
			Measurement uncertainty:	0,05 dB
10	**High optical power** IEC 61300-2-14	During the test, the insertion loss limits of test no. 3 shall be met. Moreover, during and on completion of the test, the insertion loss shall be within ±0,3 dB of original value under ambient environmental conditions. On completion of the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation limits of test no. 4 shall be met.	Source type	LD
			Max. total optical power to be applied:	300 mW (sum of the input power for all ports)
			Wavelength:	For each port the desired wavelength from test no. 1
			Test duration:	0,5 h
			Measurement uncertainty:	Insertion loss: 0,1 dB Return loss: 1 dB

No.	Test	Requirement	Details	
11	**Cold** IEC 61300-2-17	During the test, the insertion loss limits of test no. 3 shall be met. Moreover, during and on completion of the test, the insertion loss shall be within ±0,3 dB of original value under ambient conditions. During the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation limits of test no. 4 shall be met.	Temperature:	–10 °C ± 2 °C
			Duration of the exposure:	96 h
			Maximum sampling interval during the test:	1 h
			Measurements required:	Insertion loss shall be measured before, during and after the test. Return loss shall be measured before, during and after the test.
12	**Dry heat – High temperature endurance** IEC 61300-2-18	During the test, the insertion loss limits of test no. 3 shall be met. Moreover, during and on completion of the test, the insertion loss shall be within ±0,3 dB of original value under ambient conditions. During the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation limits of test no. 4 shall be met.	Temperature:	+60 °C ± 2 °C
			Duration of the exposure:	96 h
			Maximum sampling interval during the test:	1 h
			Measurements required:	Insertion loss shall be measured before, during and after the test. Return loss shall be measured before, during and after the test.
13	**Change of temperature** IEC 61300-2-22	During the test, the insertion loss limits of test no. 3 shall be met. Moreover, during and on completion of the test, the insertion loss shall be within ±0,3 dB of original value under ambient conditions. During the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation limits of test no. 4 shall be met.	High temperature:	+60 °C ± 2 °C
			Low temperature:	−10 °C ± 2 °C
			Number of cycles:	5
			Rate of temperature change:	1 °C/min
			Duration at extreme temperatures:	1 h
			Maximum sampling interval during the test:	0,5 h
			Measurements required:	Insertion loss shall be measured before, during and after the test. Return loss shall be measured before, during and after the test.
14	**Damp heat (steady state)** IEC 61300-2-19	During the test, the insertion loss limits of test no. 3 shall be met. Moreover, during and on completion of the test, the insertion loss shall be within ±0,3 dB of original value under ambient conditions. During the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation limits of test no. 4 shall be met.	Temperature:	+40 °C ± 2 °C
			Humidity:	93 % RH + 2 % RH, −3 % RH
			Duration of the exposure:	96 h
			Maximum sampling interval during the test:	1 h
			Measurements required:	Insertion loss shall be measured before, during and after the test. Return loss shall be measured before, during and after the test.

No.	Test	Requirement	Details	
15	**Vibration** IEC 61300-2-1	On completion of the tes,t the insertion loss limits of test no. 3 shall be met. On completion of the test, the insertion loss shall be within ±0,3 dB of original value. On completion of the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation 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.
16	**Shock** IEC 61300-2-9	On completion of the test, the insertion loss limits of test no. 3 shall be met. On completion of the test, the insertion loss shall be within ±0,3 dB of original value. On completion of the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation limits of test no. 4 shall be met.	Acceleration:	5 000 m/s²
			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.
17	**Fibre or cable retention** IEC 61300-2-4	On completion of the test, the insertion loss limits of test no. 3 shall be met. On completion of the test, the insertion loss shall be within ±0,3 dB of original value. On completion of the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation 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.
18	**Flexing of the strain relief of fibre optic devices** IEC 61300-2-44	On completion of the test, the insertion loss limits of test no. 3 shall be met. On completion of the test, the insertion loss shall be within ±0,3 dB of original value. On completion of the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation 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.

No.	Test	Requirement	Details	
19	**Static side load** IEC 61300-2-42	On completion of the test, the insertion loss limits of test no. 3 shall be met. On completion of the test, the insertion loss shall be within ±0,3 dB of original value. On completion of the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation limits of test no. 4 shall be met.	Magnitude of the load:	(1,0 N ± 0,1 N) for reinforced cable (0,2 N ± 0,1 N) for secondary coated fibres
			Load application point:	0,3 m from the end of device
			Directions of load:	Two mutually perpendicular directions
			Duration of the load:	1 h for reinforced cable 5 min for secondary coated fibres
			Measurements required:	Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test.
20	**Torsion** IEC 61300-2-5	On completion of the test, the insertion loss limits of test no. 3 shall be met. On completion of the test, the insertion loss shall be within ±0,3 dB of original value. On completion of the test, the return loss limits of test no. 8 shall be met. On completion of the test, the total channel isolation limits of test no. 4 shall be met.	Magnitude of the torsion/twist:	(5,0 N ± 0,2 N) for reinforced cable (2,0 N ± 0,1 N) for secondary coated fibres
			Number of cycles:	10
			Angle:	±180°
			Measurements required:	Insertion loss shall be measured before and after the test. Return loss shall be measured before and after the test.

[a] These wavelengths correspond to central wavelengths as specified in ITU-T Recommendation ITU-G.694.2.

[b] This passband corresponds to a maximum central wavelength deviation of ±6,5 nm as specified in ITU-T Recommendation G.695.

[c] Type A are CWDM using integrated free space technology. Type B are CWDM using cascaded 1-channel devices. Therefore, the achievable insertion loss is different.

[d] Insertion loss (attenuation) is the maximum value of the attenuations within all passbands.

[e] The buyer and manufacturer may agree to discard it. However, the potential negative effect of this parameter on system performance shall not be neglected.