IEC 61755-2-1

Edition 2.0 2022-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Fibre optic interconnecting devices and passive components – Connector optical interfaces for single-mode fibres – Part 2-1: Connection parameters of dispersion unshifted physically contacting fibres – Non-angled

Dispositifs d'interconnexion et composants passifs fibroniques – Interfaces optiques des connecteurs pour fibres unimodales – Partie 2-1: Paramètres de connexion des fibres en contact physique à dispersion non décalée – Sans angle

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CONTENTS

FOREWORD 3
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Attenuation and return loss grades 6
5 Criteria for a fit within attenuation and return loss grades 7
5.1 General 7
5.2 Attenuation grades and criteria 7
5.3 Visual requirements for return loss grades 8
Annex A (informative) Effect of damaged surface layer on non-angled connections 10
Bibliography 12

Figure 1 – Lateral offset and angular offset versus attenuation, $\eta_{combined}$, for single-mode fibre with 8,9 µm MFD at 1 310 nm 8
Figure A.1 – Model of the connection of convex polished end faces under compressive load 10
Figure A.2 – High index layer refractive index and thickness versus return loss for a typical dispersion unshifted single-mode fibre 11

Table 1 – Single-mode random mate attenuation grades 6
Table 2 – Single-mode return loss grades 6
Table 3 – MFD and fibre core nominal index of refraction 7
Table 4 – Visual requirements for single-mode PC polished fibres with RL grade 2 single-mode (SM) (RL ≥ 45 dB) 9
Table 5 – Visual requirements for single-mode PC polished fibres with RL grade 3 single-mode (SM) (RL ≥ 35 dB) 9
Table 6 – Visual requirements for single-mode PC polished fibres with RL grade 4 single-mode (SM) (RL ≥ 26 dB) 9

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – CONNECTOR OPTICAL INTERFACES FOR SINGLE-MODE FIBRES –

Part 2-1: Connection parameters of dispersion unshifted physically contacting fibres – Non-angled

FOREWORD

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IEC 61755-2-1 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 second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

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

a) addition of normative references and visual requirement tables;
b) reconsideration of the whole parts of the text to avoid misuse of the standard.

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

Draft	Report on voting
86B/4629/FDIS	86B/4653/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 61755 series, published under the general title *Fibre optic interconnecting devices and passive components – Connector optical interfaces for single-mode fibres*, can be found on the IEC website.

Future documents in this series will carry the new general title as cited above. Titles of existing documents in this series will be updated at the time of the next edition.

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 – CONNECTOR OPTICAL INTERFACES FOR SINGLE-MODE FIBRES –

Part 2-1: Connection parameters of dispersion unshifted physically contacting fibres – Non-angled

1 Scope

This part of IEC 61755 defines a set of prescribed conditions for a single-mode fibre optic connection that is maintained in order to satisfy the requirements of attenuation and return loss (RL) performance in a randomly mated pair of non-angled polished physically contacting (PC) fibres. The model uses a Gaussian distribution of light intensity over the specified mode field diameter (MFD) for determination of attenuation performance grades, based on MFD mismatch and the amount of lateral and angular fibre core offsets. Attenuation and RL performance grades are defined in IEC 61755-1.

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

IEC 61300-3-34, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-34: Examinations and measurements – Attenuation of random mated connectors*

IEC 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – Visual inspection of fibre optic connectors and fibre-stub transceivers*

IEC 61300-3-45, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-45: Examinations and measurements – Attenuation of random mated multi-fibre connectors*

IEC 61755-1, *Fibre optic interconnecting devices and passive components – Connector optical interfaces for single-mode fibres – Part 1: Optical interfaces for dispersion unshifted fibres – General and guidance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61755-1 and the following apply.

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

3.1
defect size
diameter of the smallest circle that can encompass the entire defect

4 Attenuation and return loss grades

Attenuation and return loss grades that shall be used for PC polished connections are given in Table 1 and Table 2 according to IEC 61755-1. The return loss grades are for non-angled contacting fibres only. The grade that shall be used for angled PC (APC) connections is given separately in IEC 61755-2-2.

Table 1 – Single-mode random mate attenuation grades

Attenuation grade	Attenuation Mean dB	Attenuation [a] ≥ 97 % [b] dB	Notes
A			Reserved for future application
B	≤ 0,12	≤ 0,25	
C	≤ 0,25	≤ 0,50	
D	≤ 0,50	≤ 1,0	

[a] Attenuation shall be measured by IEC 61300-3-34 for single-fibre connectors and IEC 61300-3-45 for multi-fibre connectors.

[b] The probability of a randomly mated connection set meeting the specified attenuation requirement will be ≥ 97 %. This performance is reached by means of a statistical distribution of connection parameters (MFD mismatch, lateral offset and angular offset) using a nominal value for wavelength of 1 310 nm.

Table 2 – Single-mode return loss grades

Return loss grade	Return loss (mated) [a] dB	Notes
1	-	Grade 1 is defined as ≥ 60 dB and reserved for use with angled, physically contacting fibres as defined in IEC 61755-2-2.
2	≥ 45	
3	≥ 35	
4	≥ 26	

[a] The test shall be carried out according to IEC 61300-3-6.

Single-mode attenuation and return loss grades are applicable for the wavelengths from 1 310 nm to 1 625 nm.

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5 Criteria for a fit within attenuation and return loss grades

5.1 General

The following Figure 1 and Table 3, Table 4, Table 5 and Table 6 give the criteria for meeting the attenuation and return loss grades listed in Table 1 and Table 2. The parameters chosen for the criteria definition are based on the degree of significance by which they affect the performance under test. The criteria selected are based on the theoretical model in 5.2 and 5.3 as well as experimental results.

5.2 Attenuation grades and criteria

Using a Gaussian distribution for the incident light, the attenuation of the joint between two dispersion unshifted single-mode optical fibres defined by IEC 60793-2-50 category B is given by Formula (1). Attenuation is also referred to as insertion loss, or coupling efficiency of the fibres.

The range of the nominal MFD and index of refraction (n_0) of the fibre cores are given in Table 3.

Table 3 – MFD and fibre core nominal index of refraction

Fibre sub-category	Nominal wavelength nm	Nominal MFD µm	n_0 (core)
IEC 60793-2-50 fibres	1 310	8,6 to 9,2	1,452 0

These attenuation grades are based on a statistical approach defining parameter values of connection populations to be less than or equal to the given value in 97 % of the connections. This performance is assumed at the nominal wavelength with fibre MFD in the range defined in IEC 60793-2-50 family specification for single-mode dispersion unshifted fibres category B.

Populations of lateral and angular offset of the randomly mated connections are assumed to be statistically distributed within the specific ranges of parameter values d and θ in Formula (1).

Each curve given in Figure 1 represents maximum allowable combinations of lateral offset and angular offset so as not to exceed the specified attenuation of any single connection, without the contribution from fibre MFD mismatch. Additional attenuation due to mismatch of the MFD from the randomly selected fibres is included in Formula (1).

Formula (1) is applicable to wavelengths from the range between 1 310 nm and 1 625 nm, using the parameters for these wavelengths. The curves in Figure 1 are only shown at 1 310 nm wavelength.

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