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TECHNICAL REPORT

colour inside

Guidelines for combining different single-mode ~~fibres types~~ fibre sub-categories

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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GUIDELINES FOR COMBINING DIFFERENT SINGLE-MODE ~~FIBRES TYPES~~ FIBRE SUB-CATEGORIES

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC TR 62000:2010. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC TR 62000 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is a Technical Report.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

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

a) global uniformity of terminology concerning fibre classes, categories and sub-categories throughout the document;
b) updating and aligning to the new naming convention of IEC 60793-2-50 for class B fibre categories and sub-categories;
c) updating and aligning with IEC 60793-2-50 as per supported fibre sub-categories;
d) additional guidelines concerning combination of fibre parameters: chromatic dispersion and slope, polarization mode dispersion;
e) additional guidelines concerning non-linear affects;
f) updating of bibliographical references.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
86A/2114/DTR	86A/2129/RVDTR

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 Technical Report 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.

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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GUIDELINES FOR COMBINING DIFFERENT SINGLE-MODE ~~FIBRES TYPES~~ FIBRE SUB-CATEGORIES

1 Scope

This document provides guidelines concerning single-mode fibre inter-compatibility.

A given ~~type~~ category of single-mode fibre, for example ~~B4~~ B-655, ~~may~~ can have different implementations by suitably optimising several of the following parameters: mode field diameter (hence effective area), chromatic dispersion coefficient, slope of the chromatic dispersion curve, cable cut-off wavelength.

These guidelines indicate the items that ~~should be~~ are taken into account when planning to connect

1) different implementations of single-mode fibres of the same ~~type~~ category, for example different implementations of ~~type~~ Class B single-mode fibres, and
2) single-mode fibres of different ~~types~~ sub-categories, for example ~~B1.1~~ B-652.B with ~~B4~~ B-655.C.

See IEC 60793-2-50 for the attributes and definitions of single-mode fibre. The attributes and definitions of fibres covered in this document are given in Table 1.

Table 1 – Correspondence table of various single-mode fibres

~~*Common name*~~	~~*Use (IEC 6079-2-50)*~~	~~*IEC Class*~~	~~*ITU-T Recommendation*~~
~~**Dispersion unshifted single-mode fibre**~~	~~Optimised for use in the 1 310 nm region but can be used in the 1 550 nm region~~	~~B1.1~~	~~G.652 A, B~~
~~**Cut-off shifted single-mode fibre**~~	~~Optimised for low loss in the 1 550 nm region, with cut-off wavelength shifted above the 1 310 nm region~~	~~B1.2~~	~~G.654~~
~~**Extended band dispersion unshifted single-mode fibre**~~	~~Optimised for use in the 1 310 nm region but can be used in the O, E, S, C and L-band (i.e. throughout the 1 260 nm to 1 625 nm range).~~	~~B1.3~~	~~G.652 C, D~~
~~**Dispersion shifted single-mode fibre**~~	~~Optimised for single channel transmission in the 1 550 nm region. Multiple channels can only be transmitted if care is taken to avoid the effects of four wave mixing by, for example, moderating the power levels or appropriate spacing or placement of the channels~~	~~B.2~~	~~G.653~~
~~**Non-zero dispersion-shifted single-mode fibre**~~	~~Optimised for multiple channel transmission in the 1 550 nm region with a cut-off wavelength that may be shifted above the 1 310 nm region~~	~~B4~~	~~G.655~~
~~**Wideband non-zero dispersion-shifted single-mode fibre**~~	~~Optimised for multiple channel transmission in the wavelength range of 1 460 to 1 625 nm with the positive value of the chromatic dispersion~~	~~B5~~	~~G.656~~

~~Common name~~	~~Use (IEC 6079-2-50)~~	~~IEC Class~~	~~ITU-T Recommendation~~
	~~coefficient that is greater than some non-zero value over the same wavelength range.~~		
~~Bend loss optimised~~	~~Bending loss insensitive single-mode fibre suitable for use in the access networks, including inside buildings at the end of these networks.~~ ~~B6_a fibres are suitable to be used in the O, E, S, C and L-band (i.e. throughout the 1 260 nm to 1 625 nm range) and meet the requirements of B1.3 fibres.~~	~~B6_a~~	~~G.657.A~~
	~~Bending loss insensitive single-mode fibre suitable for use in the access networks, including inside buildings at the end of these networks.~~ ~~B6_b fibres are suitable for transmission at 1 310 nm, 1 550 nm, and 1 625 nm for restricted distances that are associated with in-building transport of signals.~~	~~B6_b~~	~~G.657.B~~

Common name	Use (IEC 60793-2-50)	IEC sub-category	ITU-T Recommendation
Dispersion unshifted fibre	Optimised for use in the 1 310 nm region but can be used in the 1 550 nm region.	B-652.B	G.652.B
Extended band dispersion unshifted fibre	Optimised for use in the 1 310 nm region but can be used in the O, E, S, C and L-band (i.e. throughout the 1 260 nm to 1 625 nm range).	B-652.D	G.652.D
Dispersion shifted fibre	Optimised for single channel transmission in the 1 550 nm region. Multiple channels can only be transmitted if care is taken to avoid non-linear effects such as four wave mixing by, for example, moderating the power levels or appropriate spacing or placement of the channels.	B-653.A	G.653.A
		B-653.B	G.653.B
Cut-off shifted fibre	Optimised for low loss in the 1 550 nm region, with cut off wavelength shifted above the 1 310 nm region.	B-654.A	G.654.A
		B-654.B	G.654.B
		B-654.C	G.654.C
		B-654.D	G.654.D
		B-654.E	G.654.E
Non-zero dispersion-shifted fibre	Optimised for multiple channel transmission in the 1 530 to 1 625 nm region with a positive or negative, non-zero chromatic dispersion and a cut off wavelength that can be shifted above the 1 310 nm region.	B-655.C	G.655.C
		B-655.D	G.655.D
		B-655.E	G.655.E
Wideband non-zero dispersion-shifted fibre	Optimised for multiple channel transmission in the wavelength range of 1 460 nm to 1 625 nm with the positive value of the chromatic dispersion coefficient that is greater than some non-zero value over the same wavelength range.	B-656	G.656

Common name	Use (IEC 60793-2-50)	IEC sub-category	ITU-T Recommendation
Bending loss insensitive fibre	Bending loss insensitive single-mode fibre suitable for use in the access networks, including inside buildings at the end of these networks. They are suitable to be used in the O, E, S, C and L-band (i.e. throughout the 1 260 nm to 1 625 nm range) and, in the case of B-657.A1 and B-657.A2, meet the requirements of B-652.D fibres. Subcategories B-657.B2 and B-657.B3 fibres are intended to be used for restricted distances (less than 1 000 m) at the end of access networks, in particular inside buildings or near buildings (e.g. outside building riser cabling).	B-657.A1	G.657.A1
		B-657.A2	G.657.A2
		B-657.B2	G.657.B2
		B-657.B3	G.657.B3

This document does not consider the connection of fibres with the same ~~implementation~~ category from different manufacturers, which is already considered by the standardisation procedure.

2 Normative references

There are no normative references in this document.

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c) updating and aligning with IEC 60793-2-50 as per supported fibre sub-categories;
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A given category of single-mode fibre, for example B-655, can have different implementations by suitably optimising several of the following parameters: mode field diameter (hence effective area), chromatic dispersion coefficient, slope of the chromatic dispersion curve, cable cut-off wavelength.

These guidelines indicate the items that are taken into account when planning to connect

1) different implementations of single-mode fibres of the same category, for example different implementations of Class B single-mode fibres, and
2) single-mode fibres of different sub-categories, for example B-652.B with B-655.C.

See IEC 60793-2-50 for the attributes and definitions of single-mode fibre. The attributes and definitions of fibres covered in this document are given in Table 1.

Table 1 – Correspondence table of various single-mode fibres

Common name	Use (IEC 60793-2-50)	IEC sub-category	ITU-T Recommendation
Dispersion unshifted fibre	Optimised for use in the 1 310 nm region but can be used in the 1 550 nm region.	B-652.B	G.652.B
Extended band dispersion unshifted fibre	Optimised for use in the 1 310 nm region but can be used in the O, E, S, C and L-band (i.e. throughout the 1 260 nm to 1 625 nm range).	B-652.D	G.652.D
Dispersion shifted fibre	Optimised for single channel transmission in the 1 550 nm region. Multiple channels can only be transmitted if care is taken to avoid non-linear effects such as four wave mixing by, for example, moderating the power levels or appropriate spacing or placement of the channels.	B-653.A	G.653.A
		B-653.B	G.653.B
Cut-off shifted fibre	Optimised for low loss in the 1 550 nm region, with cut off wavelength shifted above the 1 310 nm region.	B-654.A	G.654.A
		B-654.B	G.654.B
		B-654.C	G.654.C
		B-654.D	G.654.D
		B-654.E	G.654.E
Non-zero dispersion-shifted fibre	Optimised for multiple channel transmission in the 1 530 to 1 625 nm region with a positive or negative, non-zero chromatic dispersion and a cut off wavelength that can be shifted above the 1 310 nm region.	B-655.C	G.655.C
		B-655.D	G.655.D
		B-655.E	G.655.E
Wideband non-zero dispersion-shifted fibre	Optimised for multiple channel transmission in the wavelength range of 1 460 nm to 1 625 nm with the positive value of the chromatic dispersion coefficient that is greater than some non-zero value over the same wavelength range.	B-656	G.656

Common name	Use (IEC 60793-2-50)	IEC sub-category	ITU-T Recommendation
Bending loss insensitive fibre	Bending loss insensitive single-mode fibre suitable for use in the access networks, including inside buildings at the end of these networks. They are suitable to be used in the O, E, S, C and L-band (i.e. throughout the 1 260 nm to 1 625 nm range) and, in the case of B-657.A1 and B-657.A2, meet the requirements of B-652.D fibres. Subcategories B-657.B2 and B-657.B3 fibres are intended to be used for restricted distances (less than 1 000 m) at the end of access networks, in particular inside buildings or near buildings (e.g. outside building riser cabling).	B-657.A1	G.657.A1
		B-657.A2	G.657.A2
		B-657.B2	G.657.B2
		B-657.B3	G.657.B3

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