IEC 60793-2

Edition 9.0 2019-11
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Optical fibres –
Part 2: Product specifications – General

IEC 60793-2:2019-11 RLV(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.10

ISBN 978-2-8322-7631-0

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60793-2 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This ninth edition cancels and replaces the eighth edition published in 2015. This edition constitutes a technical revision.

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

a) introduction of the revised fibre designations for most A1 sub-category fibres and all class B single-mode fibres;
b) addition of the new fibre model (A1-OM5) defined for A1 category;
c) addition of class D polarization maintaining fibres.

This document is to be read in conjunction with those parts of the IEC 60793-1 series that address individual measurements and tests for attributes of optical fibres.

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

FDIS	Report on voting
86A/1964/FDIS	86A/1974/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 60793 series, published under the general title *Optical fibres*, 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- withdrawn,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.

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OPTICAL FIBRES –

Part 2: Product specifications – General

1 Scope

This part of IEC 60793 contains the general specifications for both multimode and single-mode optical fibres.

Sectional specifications for each of the four categories of multimode fibres: A1, A2, A3, and A4 (part of the multimode fibre class A) contain requirements specific to each category.

Sectional specifications for each of the ~~two~~ three single-mode fibre classes, B, C and D contain requirements common to each class.

Each sectional specification includes family specifications (in normative annexes) that contain requirements for the applicable category or sub-categories. These sub-categories are distinguished on the basis of different fibre types or applications.

The requirements of this document apply to all classes.

Each sectional specification contains the requirements that are common to all the family specifications that are within it. These common requirements are copied to the family specification for ease of reference.

Tests or measurement methods are defined for each specified attribute. Where possible, these definitions are by reference to an IEC International Standard (see IEC 60793-1 series) – otherwise the test or measurement method is outlined in the relevant sectional specification.

Table 1 defines the sectional specifications. The relevant family specifications are defined within the sectional specifications as normative annexes (see Tables 2 to 5).

Annexes A and B summarize the existing fibre specifications.

Table 1 – Sectional specifications

Document ID	Fibre category/class	Cladding material	Core material	Index profile
IEC 60793-2-10	A1 multimode	Glass	Glass	Graded
IEC 60793-2-20	A2 multimode	Glass	Glass	Quasi-step or step
IEC 60793-2-30	A3 multimode	Plastic	Glass	Step or graded (under consideration)
IEC 60793-2-40	A4 multimode	Plastic	Plastic	Step, multi-step or graded
IEC 60793-2-50	B single-mode	Glass	Glass	Not applicable
IEC 60793-2-60	C single-mode	Glass	Glass	Not applicable
IEC 60793-2-70	D polarization-maintaining	Glass	Glass	Not applicable

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 60304, *Standard colours for insulation for low-frequency cables and wires*

IEC 60793-1 (all parts), *Optical fibres – Part 1: Measurement methods and test procedures*

IEC 60793-2-10:2019, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

IEC 60793-2-20:2015, *Optical fibres – Part 2-20: Product specifications – Sectional specification for category A2 multimode fibres*

IEC 60793-2-30:2015, *Optical fibres – Part 2-30: Product specifications – Sectional specification for category A3 multimode fibres*

IEC 60793-2-40:2015, *Optical fibres – Part 2-40: Product specifications – Sectional specification for category A4 multimode fibres*

IEC 60793-2-50:2018, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60793-2-60:2008, *Optical fibres – Part 2-60: Product specifications – Sectional specification for category C single-mode intraconnection fibres*

IEC 60793-2-70:2017, *Optical fibres – Part 2-70: Product specifications – Sectional specification for polarization-maintaining fibres*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1
multimode fibre
optical fibre in the core of which the radiation of two or more bound modes can propagate at the wavelength of interest

[SOURCE: IEC 60050-731:1991, 731-02-03]

3.2
single-mode fibre
optical fibre in which the radiation of only one bound mode can propagate at the wavelength of interest

[SOURCE: IEC 60050-731:1991, 731-02-02, modified – Note deleted.]

3.3
core
central region of an optical fibre through which most of the optical power is transmitted

[SOURCE: IEC 60050-731:1991, 731-02-04]

3.4
cladding
dielectric material of an optical fibre surrounding the core

[SOURCE: IEC 60050-731:1991, 731-02-05]

3.5
primary coating
thin coating applied directly to the cladding, usually at the time of the fibre drawing, in one or more layers, to preserve integrity of the cladding surface

Note 1 to entry A secondary coating may be applied directly to the primary coating of one or more fibres, to reinforce the protection of the optical fibre during handling and cabling.

[SOURCE: IEC 60050-731:1991, 731-02-57, modified – The ~~phrase~~ wording "usually at the time of the fibre drawing, in one or more layers," and Note 1 have been added.]

3.6
fibre buffer
material or assembly of materials used to protect the optical fibre against physical damage

[SOURCE: IEC 60050-731:1991, 731-02-56]

~~**3.7**~~
~~**coloured coating and/or buffer**~~
~~thin coating and/or buffer applied on the primary coating and/or buffer or on the secondary coating in order to make each fibre distinguishable by its colour~~

3.7
coloured coating
thin coating applied on the primary coating or on the secondary coating in order to make each fibre distinguishable by its colour

3.8
coloured buffer
buffer applied on the primary coating and/or secondary coating in order to make each fibre distinguishable by its colour

4 Quality assurance

It is the responsibility of the supplier to establish quality assurance by quality control procedures which ensures that the product meets the requirements of this document and the related sectional specifications and family specifications. It is not intended that a complete testing programme be carried out on every length of fibre. When the customer wishes to specify acceptance tests or other quality procedures, it is essential that an agreement be reached between the supplier and the customer at the time of ordering.

5 Construction of optical fibres

5.1 Class A – Multimode fibres

The main fibre categories are based on g, the refractive index profile parameter, see Table 2.

The normalized index profile is expressed as:

$$\delta(x) = 1 - x^g \tag{1}$$

where

$$\delta(x) = \frac{n(x) - n(1)}{n(0) - n(1)} \tag{2}$$

$x = \frac{r}{a}$ $(0 \le r \le a)$ is the normalized radial position; (3)

a is the core radius;

$n(x)$ is the refractive index at normalized position x.

Table 2 – Main categories of multimode fibres

Category	Material	Type	Limits
A1	Glass core/glass cladding	Graded index fibre	$1 \le g < 3$
A2	Glass core/glass cladding	Step and quasi-step index fibre	$3 \le g < \infty$
A3	Glass core/plastic cladding	Step index fibre or graded index fibre (under consideration)	$10 \le g < \infty$ $1 \le g \le 3$
A4	Plastic core/plastic cladding	Step, multi-step, or graded index fibre	$1 \le g < \infty$
NOTE Attention is drawn to the index profile as stated in the detail specification. The fibre category is determined on the basis of the material type and the g value which best fits the normalized refractive index profile, falling within the category defined above.			

A further differentiation of sub-categories (and models) inside the main categories is given in Table 3.

Table 3 – Sub-categories of multimode fibres

Category	Sub-categories/Models	Nominal core diameter µm	Nominal cladding diameter µm	Nominal coating diameter µm	Nominal numerical aperture (NA_{ff})
A1					
	A1a With models: A1a.1a (traditional macrobend loss) A1a.1b (enhanced macrobend loss) A1a.2a (traditional macrobend loss) A1a.2b (enhanced macrobend loss) A1a.3a (traditional macrobend loss) A1a.3b (enhanced macrobend loss)	50	125	245	0,20
	A1b	62,5	125	245	0,275
	A1d	100	140	245	0,26 or 0,29
A2					
	A2a	100	140	NS	0,23 or 0,26
	A2b	200	240	NS	0,23 or 0,26
	A2c	200	280	NS	0,23 or 0,26
A3					
	A3a	200	300	900	0,40
	A3b	200	380	600	0,40
	A3c	200	230	500	0,40
	A3d	200	230	500	0,35
	A3e	200	230	500	0,37
	A3f (Under consideration)	50	230	500	0,20
	A3g (Under consideration)	62,5	230	500	0,275
A4					
	A4a (With models A4a.1 and A4a.2)	NS	1 000	NA	(A4a.1): 0,50 (A4a.2): 0,485
	A4b	NS	750	NA	0,50
	A4c	NS	500	NA	0,50
	A4d	NS	1 000	NA	0,30
	A4e	≥500	750	NA	0,25
	A4f	200	490	NA	0,19
	A4g	120	490	NA	0,19
	A4h	62,5	245	NA	0,19
NOTE 1 NA = not applicable; NS = not specified. NOTE 2 All three A1a models indicated in Table 3 differ in bandwidth (or DMD) requirements.					

Category	Sub-category	Model	Nominal core diameter µm	Nominal cladding diameter µm	Nominal coating diameter µm	Nominal numerical aperture (NA_{ff})
A1						
	A1-OM2	A1-OM2a (traditional macrobend loss)	50	125	245	0,20
		A1-OM2b (enhanced macrobend loss)				
	A1-OM3	A1-OM3a (traditional macrobend loss)				
		A1-OM3b (enhanced macrobend loss)				
	A1-OM4	A1-OM4a (traditional macrobend loss)				
		A1-OM4b (enhanced macrobend loss)				
	A1-OM5	A1-OM5a (traditional macrobend loss)				
		A1-OM5b (enhanced macrobend loss)				
	A1-OM1		62,5	125	245	0,275
	A1d		100	140	245	0,26 or 0,29
A2						
	A2a		100	140	NS	0,23 or 0,26
	A2b		200	240	NS	0,23 or 0,26
	A2c		200	280	NS	0,23 or 0,26
A3						
	A3a		200	300	900	0,40
	A3b		200	380	600	0,40
	A3c		200	230	500	0,40
	A3d		200	230	500	0,35
	A3e		200	230	500	0,37
	A3f		50	230	500	0,20
	A3g		62,5	230	500	0,275
A4						
	A4a	A4a.1	NS	1 000	NA	(A4a.1): 0,50
		A4a.2				(A4a.2): 0,485
	A4b		NS	750	NA	0,50
	A4c		NS	500	NA	0,50
	A4d		NS	1 000	NA	0,30
	A4e		≥ 500	750	NA	0,25
	A4f		200	490	NA	0,19
	A4g		120	490	NA	0,19
	A4h		62,5	245	NA	0,19

Category	Sub-category	Model	Nominal core diameter µm	Nominal cladding diameter µm	Nominal coating diameter µm	Nominal numerical aperture (NA_{ff})
NOTE 1 NA = not applicable; NS = not specified. NOTE 2 All five A1-OMx sub-categories indicated differ in bandwidth (or DMD) requirements. NOTE 3 Most A1 sub-categories have been changed in terms of fibre designation, starting from IEC 60793-2-10:2019 (edition 7). See Table 1 of IEC 60793-2-10:2019 for cross-references to former fibre designations.						

5.2 Class B – Single-mode fibres

The categories of single-mode fibres currently in use are given in Table 4.

Table 4 – Categories of glass core/glass clad single-mode fibres

~~Category~~	~~Type~~	~~Description~~
~~B1.1~~	~~Dispersion unshifted~~	~~This dispersion unshifted single-mode fibre is optimised for use in the 1 310 nm region but can be used in the 1 550 nm and 1 625 nm regions. Depending on link length and bit rates, dispersion may need accommodation in the 1 550 nm region.~~
~~B1.2~~	~~Cut-off shifted~~	~~This category of dispersion unshifted single-mode fibre is optimised for low loss in the 1 550 nm region.~~
~~B1.3~~	~~Extended band~~	~~This dispersion unshifted single-mode fibre can be used from 1 260 nm up to 1 625 nm. Chromatic dispersion in this band may impose requirements either on the maximum link length, or the need for accommodation.~~
~~B2~~	~~Dispersion shifted~~	~~This dispersion-shifted single-mode fibre is 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.~~ ~~Two sub-categories are recognized (B2_a and B2_b) differing in chromatic dispersion characteristics.~~
~~B4~~	~~Non-zero dispersion-shifted~~	~~This dispersion-shifted single-mode fibre is optimised for multiple channel transmission in the 1 550 nm region. The dispersion coefficient is required to be non-zero throughout the band from 1 530 nm to 1 565 nm, but may be either positive or negative. Depending on the dispersion characteristics, multiple channel transmission may be possible at bands either above or below the normal 1 550 nm region.~~ ~~Three sub-categories are recognized (B4_c, B4_d and B4_e), differing in chromatic dispersion characteristics.~~
~~B5~~	~~Wideband non-zero dispersion-shifted~~	~~This wideband non-zero dispersion-shifted single-mode fibre is 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. This fibre can be used for both CWDM and DWDM systems throughout the wavelength region between 1 460 nm and 1 625 nm.~~

~~Category~~	~~Type~~	~~Description~~
~~B6~~	~~Bending loss insensitive~~	~~This category of single-mode fibre is optimised for improved bending loss.~~ ~~Four sub-categories are recognized:~~ ~~B6_a1 and B6_a2 fibres are a subset of category B1.3 fibres and therefore are compliant with B1.3 fibres and have the same transmission properties. Sub-category B6_a1 fibres are appropriate for a minimum bend radius of 10 mm; sub-category B6_a2 fibres for a minimum bend radius of 7,5 mm.~~ ~~B6_b2 and B6_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). Application length of B6_b fibre, however, depends on the deployment strategy of each network operator.~~ ~~Sub-category B6_b fibres are not necessarily compliant with category B1.3 fibres in terms of chromatic dispersion coefficient specifications. These fibres, however, are system compatible with B6_a (and B1.3) fibres in Access networks.~~ ~~Sub-category B6_b2 fibres are appropriate for a minimum bend radius of 7,5 mm; sub-category B6_b3 fibres for a minimum bend radius of 5 mm.~~

Category	Type	Description
B-652	Dispersion unshifted	Dispersion unshifted single-mode fibre. Two sub-categories are recognized: B-652.B is optimised for use in the 1 310 nm region but can be used in the 1 550 nm and 1 625 nm regions. Depending on link length and bit rates, dispersion may need accommodation in the 1 550 nm region. B-652.D can be used over the extended wavelength range from 1 260 nm up to 1 625 nm. Chromatic dispersion in this band may impose requirements either on the maximum link length or the need for accommodation.
B-653	Dispersion shifted	This dispersion-shifted single-mode fibre is 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. Two sub-categories are recognized (B-653.A and B-653.B) differing in chromatic dispersion characteristics.
B-654	Cut-off shifted	This category of dispersion unshifted single-mode fibre is optimised for low loss in the 1 550 nm region. Five sub-categories are recognized (B-654.A, B-654.B, B-654.C, B-654.D and B-654.E) differing in chromatic dispersion and mode field characteristics.
B-655	Non-zero dispersion-shifted	This dispersion-shifted single-mode fibre is optimised for multiple channel transmission in the 1 550 nm region. The dispersion coefficient is required to be non-zero throughout the band from 1 530 nm to 1 565 nm, but may be either positive or negative. Depending on the dispersion characteristics, multiple channel transmission may be possible at bands either above or below the normal 1 550 nm region. Three sub-categories are recognized (B-655.C, B-655.D and B-655.E), differing in chromatic dispersion characteristics.
B-656	Wideband non-zero dispersion-shifted	This wideband non-zero dispersion-shifted single-mode fibre is 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. This fibre can be used for both CWDM and DWDM systems throughout the wavelength region between 1 460 nm and 1 625 nm.

Category	Type	Description
B-657	Bending loss insensitive	This category of single-mode fibre is optimised for improved bending performance. Four sub-categories are recognized: B-657.A1 and B-657.A2 fibres are a subset of category B-652.D fibres and therefore are compliant with B-652.D fibres and have the same transmission properties. Sub-category B-657.A1 fibres are appropriate for a minimum bend radius of 10 mm; sub-category B-657.A2 fibres for a minimum bend radius of 7,5 mm. 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). Application length of B-657.B fibre, however, depends on the deployment strategy of each network operator. Sub-category B-657.B fibres are not necessarily compliant with category B-652.D fibres in terms of chromatic dispersion coefficient specifications. These fibres, however, are system compatible with B-657.A (and B-652.D) fibres in access networks. Sub-category B-657.B2 fibres are appropriate for a minimum bend radius of 7,5 mm; sub category B-657.B3 fibres for a minimum bend radius of 5 mm.
NOTE The Class B categories have been changed in fibre designation, starting from IEC 60793-2-50:2018 (edition 6). See Table 1 of IEC 60793-2-50:2018 for cross-references to former fibre designations.		

5.3 Class C – Single-mode fibres for intraconnection

The categories of single-mode fibres for intraconnection currently in use are given in Table 5.

Table 5 – Categories of glass core/glass clad single-mode fibres for intraconnection

Category	Type	Description
C1	Single-mode intraconnection fibre suitable for use with any class B single-mode fibre at wavelengths from 1 260 nm to 1 625 nm.	This category of single-mode fibre is optimised for precision glass geometry and improved macrobending, and generally having lower fibre cut-off wavelength compared to that of ~~B1.1~~ B-652.B fibres.
C2	Single-mode intraconnection fibre suitable for use from 1 260 nm to 1 360 nm.	This category of single-mode fibre with reduced mode field diameter is optimised for loss performance in the 1 310 nm region.
C3	Single-mode intraconnection fibre suitable for use from 1 530 nm to 1 625 nm.	This category of single-mode fibre with reduced mode field diameter is optimised for loss performance in the 1 550 nm region.
C4	Single-mode intraconnection fibre suitable for use at 980 nm.	This single-mode intraconnection fibre is intended to support 980 nm transmissions.
NOTE All four categories indicated have sub-categories based on 125 μm and 80 μm cladding diameter.		

5.4 Class D – Polarization-maintaining fibres

The categories of polarization-maintaining fibres currently in use are given in Table 6.

Table 6 – Categories of glass core/glass clad polarization-maintaining fibres

Category	Type	Description
D1	Polarization-maintaining fibre suitable for use at 980 nm	This category of polarization-maintaining fibre is optimised for polarization-maintaining ability in the 980 nm region. This fibre is used for erbium-doped fibre amplifier.
D2	Polarization-maintaining fibre suitable for use at 1 310 nm	This category of polarization-maintaining fibre is optimised for polarization-maintaining ability and connection property of category B fibres in the 1 310 nm region.
D3	Polarization-maintaining fibre suitable for use at 1 550 nm	This category of polarization-maintaining fibre is optimised for polarization-maintaining ability and connection property of category B fibres in the 1 550 nm region.

6 General requirements

6.1 Coating

Fibres with glass cladding shall be coated with a material suitable for protecting the cladding material from damage. For fibres with coatings:

a) the coating shall be in close contact with the cladding material to preserve the initial integrity of the surface;

b) the coating consists of one or more layers of the same or different materials;

c) the coating shall be removable for connecting purposes, except where it is used as a reference surface. The method of removal shall be agreed between the supplier and the customer.

6.2 Interface with the coating

The interstices between the coated fibre (when the fibre is coated) and loose buffer can be filled with a suitable fluid or easily deformable materials.

6.3 Colours of the coating

When fibre is coloured:

a) colours shall correspond ~~reasonably~~ as far as possible with IEC 60304, of which the following are examples: natural or white, red, yellow, blue, green, etc.;

b) a marking over the colour may be used. If used, the marking shall consist of distinctive coloured rings, lines, or helices. Printed markings shall adhere satisfactorily. Marking shall be easily identifiable with a constant repeated distance.

Annex A
(normative)

Existing multimode fibres

Table A.1 lists existing categories of multimode fibres.

Table A.1 – Existing multimode fibres

Class	Category	Sub-category	Model	Document
A: Multimode fibres				
	A1 – Graded index (glass core/glass cladding)			IEC 60793-2-10:2019
		~~A1a~~ A1-OM2	A1-OM2a and A1-OM2b	Annex A
		A1-OM3	~~A1a.1a and A1a.1b~~ A1-OM3a and A1-OM3b	
		A1-OM4	~~A1a.2a and A1a.2b~~ A1-OM4a and A1-OM4b	
		A1-OM5	~~A1a.3a and A1a.3b~~ A1-OM5a and A1-OM5b	
		~~A1b~~ A1-OM1		Annex B
		A1d		Annex C
	A2 – Step index (glass core/glass cladding)			IEC 60793-2-20:2015
		A2a		Annex A
		A2b		Annex B
		A2c		Annex C
	A3 – Step or graded index (glass core/plastic cladding)			IEC 60793-2-30:2015
		A3a		Annex A
		A3b		Annex B
		A3c		Annex C
		A3d		Annex D
		A3e		Annex E
		A3f		~~Under consideration~~ Annex F
		A3g		~~Under consideration~~ Annex G
	A4 – Step or graded index plastic optical fibre			IEC 60793-2-40:2015
		A4a		Annex A
			A4a.1	
			A4a.2	
		A4b		Annex B
		A4c		Annex C
		A4d		Annex D
		A4e		Annex E
		A4f		Annex F
		A4g		Annex G

Class	Category	Sub-category	Model	Document
		A4h		Annex H

Annex B
(normative)

Existing single-mode fibres

B.1 Existing single-mode fibres

Table B.1 lists existing categories of single-mode fibres.

Table B.1 – Existing single-mode fibres

Class	Category	Sub-category	Model	Document
B: Single-mode fibres			–	IEC 60793-2-50
–	B1.1 – Dispersion unshifted			Annex A
–	–			
–	B1.2 – Cut-off shifted		–	Annex B
–	–	B1.2_b	–	–
–	–	B1.2_c	–	–
–	–			
–	B1.3 – Extended band			Annex C
–	–			
–	B2 – Dispersion shifted		–	Annex D
–	–	B2_a	–	–
–	–	B2_b	–	–
–	–			
–	B4 – Non-zero dispersion shifted			Annex E
–	–	B4_c	–	–
–	–	B4_d		–
–	–	B4_e		–
–	–			
–	B5 – Wideband non-zero dispersion shifted			Annex F
–	–			
–	B6 – Bending loss insensitive			Annex G
–		B6_a		–
			B6_a1	
–	–		B6_a2	–
–	–	B6_b		–
–	–		B6_b2	–
			B6_b3	

Class	Category	Sub-category	Model	Document
B: Single-mode fibres				IEC 60793-2-50:2019
	B-652 – Dispersion unshifted			Annex A
		B-652.B		
		B-652.D		
	B-653 – Dispersion shifted			Annex B
		B-653.A		
		B-653.B		
	B-654 – Cut-off shifted			Annex C
		B-654.A		
		B-654.B		
		B-654.C		
		B-654.D		
		B-654.E		
	B-655 – Non-zero dispersion shifted			Annex D
		B-655.C		
		B-655.D		
		B-655.E		
	B-656 – Wideband non-zero dispersion shifted			Annex E
	B-657 – Bending loss insensitive			Annex F
		B-657.A		
			B-657.A1	
			B-657.A2	
		B-657.B		
			B-657.B2	
			B-657.B3	

B.2 Existing fibres for intraconnection

Table B.2 lists existing fibres for intraconnection.

Table B.2 – Existing fibres for intraconnection

Class	Category	Sub-category		Document
C: Single-mode fibres for intraconnection				IEC 60793-2-60:2008
	C1 – ~~Applicable~~ Suitable for use from 1 280 nm to 1 625 nm			Annex A
		C1_125		
		C1_80		
	C2 – ~~Applicable~~ Suitable for use in the 1 310 nm region			Annex B

		C2_125_a and C2_125_b		
		C2_80_a and C2_80_b		
	C3 – ~~Applicable~~ Suitable for use in the 1 550 nm region			Annex C
		C3_125_a and C3_125_b		
		C3_80_a and C3_80_b		
	C4 – ~~Applicable~~ Suitable for use at 980 nm ~~region~~			Annex D
		C4_125_a and C4_125_b		
		C4_80_a and C4_80_b		

B.3 Existing polarization-maintaining fibres

Table B.3 lists existing polarization-maintaining fibres.

Table B.3 – Existing polarization-maintaining fibres

Class	Category	Sub-category		Document
D: Polarization-maintaining fibres				IEC 60793-2-70:2017
	D1 – Suitable for use at 980 nm			Annex A
	D2 – Suitable for use at 1 310 nm			Annex B
	D3 – Suitable for use at 1 550 nm			Annex C

Bibliography

IEC 60050-731:1991, *International Electrotechnical Vocabulary – Part 731: Optical fibre communication* (available at http://www.electropedia.org)

IEC 60793-2

Edition 9.0 2019-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Optical fibres –
Part 2: Product specifications – General

Fibres optiques –
Partie 2: Spécifications de produits – Généralités

IEC 60793-2:2019-11(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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OPTICAL FIBRES –

Part 2: Product specifications – General

FOREWORD

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International Standard IEC 60793-2 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This ninth edition cancels and replaces the eighth edition published in 2015. This edition constitutes a technical revision.

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

a) introduction of the revised fibre designations for most A1 sub-category fibres and all class B single-mode fibres;
b) addition of the new fibre model (A1-OM5) defined for A1 category;
c) addition of class D polarization maintaining fibres.

This document is to be read in conjunction with those parts of the IEC 60793-1 series that address individual measurements and tests for attributes of optical fibres.

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

FDIS	Report on voting
86A/1964/FDIS	86A/1974/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 60793 series, published under the general title *Optical fibres*, 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.

OPTICAL FIBRES –

Part 2: Product specifications – General

1 Scope

This part of IEC 60793 contains the general specifications for both multimode and single-mode optical fibres.

Sectional specifications for each of the four categories of multimode fibres: A1, A2, A3, and A4 (part of the multimode fibre class A) contain requirements specific to each category.

Sectional specifications for each of the three single-mode fibre classes, B, C and D contain requirements common to each class.

Each sectional specification includes family specifications (in normative annexes) that contain requirements for the applicable category or sub-categories. These sub-categories are distinguished on the basis of different fibre types or applications.

The requirements of this document apply to all classes.

Each sectional specification contains the requirements that are common to all the family specifications that are within it. These common requirements are copied to the family specification for ease of reference.

Tests or measurement methods are defined for each specified attribute. Where possible, these definitions are by reference to an IEC International Standard (see IEC 60793-1 series) – otherwise the test or measurement method is outlined in the relevant sectional specification.

Table 1 defines the sectional specifications. The relevant family specifications are defined within the sectional specifications as normative annexes (see Tables 2 to 5).

Annexes A and B summarize the existing fibre specifications.

Table 1 – Sectional specifications

Document ID	Fibre category/class	Cladding material	Core material	Index profile
IEC 60793-2-10	A1 multimode	Glass	Glass	Graded
IEC 60793-2-20	A2 multimode	Glass	Glass	Quasi-step or step
IEC 60793-2-30	A3 multimode	Plastic	Glass	Step or graded (under consideration)
IEC 60793-2-40	A4 multimode	Plastic	Plastic	Step, multi-step or graded
IEC 60793-2-50	B single-mode	Glass	Glass	Not applicable
IEC 60793-2-60	C single-mode	Glass	Glass	Not applicable
IEC 60793-2-70	D polarization-maintaining	Glass	Glass	Not applicable

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 60304, *Standard colours for insulation for low-frequency cables and wires*

IEC 60793-1 (all parts), *Optical fibres – Part 1: Measurement methods and test procedures*

IEC 60793-2-10:2019, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

IEC 60793-2-20:2015, *Optical fibres – Part 2-20: Product specifications – Sectional specification for category A2 multimode fibres*

IEC 60793-2-30:2015, *Optical fibres – Part 2-30: Product specifications – Sectional specification for category A3 multimode fibres*

IEC 60793-2-40:2015, *Optical fibres – Part 2-40: Product specifications – Sectional specification for category A4 multimode fibres*

IEC 60793-2-50:2018, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60793-2-60:2008, *Optical fibres – Part 2-60: Product specifications – Sectional specification for category C single-mode intraconnection fibres*

IEC 60793-2-70:2017, *Optical fibres – Part 2-70: Product specifications – Sectional specification for polarization-maintaining fibres*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1
multimode fibre
optical fibre in the core of which the radiation of two or more bound modes can propagate at the wavelength of interest

[SOURCE: IEC 60050-731:1991, 731-02-03]

3.2
single-mode fibre
optical fibre in which the radiation of only one bound mode can propagate at the wavelength of interest

[SOURCE: IEC 60050-731:1991, 731-02-02, modified – Note deleted.]

3.3
core
central region of an optical fibre through which most of the optical power is transmitted

[SOURCE: IEC 60050-731:1991, 731-02-04]

3.4
cladding
dielectric material of an optical fibre surrounding the core

[SOURCE: IEC 60050-731:1991, 731-02-05]

3.5
primary coating
thin coating applied directly to the cladding, usually at the time of the fibre drawing, in one or more layers, to preserve integrity of the cladding surface

Note 1 to entry A secondary coating may be applied directly to the primary coating of one or more fibres, to reinforce the protection of the optical fibre during handling and cabling.

[SOURCE: IEC 60050-731:1991, 731-02-57, modified – The wording "usually at the time of the fibre drawing, in one or more layers," and Note 1 have been added.]

3.6
fibre buffer
material or assembly of materials used to protect the optical fibre against physical damage

[SOURCE: IEC 60050-731:1991, 731-02-56]

3.7
coloured coating
thin coating applied on the primary coating or on the secondary coating in order to make each fibre distinguishable by its colour

3.8
coloured buffer
buffer applied on the primary coating and/or secondary coating in order to make each fibre distinguishable by its colour

4 Quality assurance

It is the responsibility of the supplier to establish quality assurance by quality control procedures which ensures that the product meets the requirements of this document and the related sectional specifications and family specifications. It is not intended that a complete testing programme be carried out on every length of fibre. When the customer wishes to specify acceptance tests or other quality procedures, it is essential that an agreement be reached between the supplier and the customer at the time of ordering.

5 Construction of optical fibres

5.1 Class A – Multimode fibres

The main fibre categories are based on g, the refractive index profile parameter, see Table 2.

The normalized index profile is expressed as:

$$\delta(x) = 1 - x^g \tag{1}$$

where

$$\delta(x) = \frac{n(x) - n(1)}{n(0) - n(1)} \tag{2}$$

$x = \frac{r}{a}$ $(0 \le r \le a)$ is the normalized radial position; (3)

a is the core radius;

$n(x)$ is the refractive index at normalized position x.

Table 2 – Main categories of multimode fibres

Category	Material	Type	Limits
A1	Glass core/glass cladding	Graded index fibre	$1 \le g < 3$
A2	Glass core/glass cladding	Step and quasi-step index fibre	$3 \le g < \infty$
A3	Glass core/plastic cladding	Step index fibre or graded index fibre (under consideration)	$10 \le g < \infty$ $1 \le g \le 3$
A4	Plastic core/plastic cladding	Step, multi-step, or graded index fibre	$1 \le g < \infty$
NOTE Attention is drawn to the index profile as stated in the detail specification. The fibre category is determined on the basis of the material type and the g value which best fits the normalized refractive index profile, falling within the category defined above.			

A further differentiation of sub-categories (and models) inside the main categories is given in Table 3.

Table 3 – Sub-categories of multimode fibres

Category	Sub-category	Model	Nominal core diameter µm	Nominal cladding diameter µm	Nominal coating diameter µm	Nominal numerical aperture (NA_{ff})
A1						
	A1-OM2	A1-OM2a (traditional macrobend loss)	50	125	245	0,20
		A1-OM2b (enhanced macrobend loss)				
	A1-OM3	A1-OM3a (traditional macrobend loss)				
		A1-OM3b (enhanced macrobend loss)				
	A1-OM4	A1-OM4a (traditional macrobend loss)				
		A1-OM4b (enhanced macrobend loss)				
	A1-OM5	A1-OM5a (traditional macrobend loss)				
		A1-OM5b (enhanced macrobend loss)				
	A1-OM1		62,5	125	245	0,275

Category	Sub-category	Model	Nominal core diameter µm	Nominal cladding diameter µm	Nominal coating diameter µm	Nominal numerical aperture (NA_{ff})
	A1d		100	140	245	0,26 or 0,29
A2						
	A2a		100	140	NS	0,23 or 0,26
	A2b		200	240	NS	0,23 or 0,26
	A2c		200	280	NS	0,23 or 0,26
A3						
	A3a		200	300	900	0,40
	A3b		200	380	600	0,40
	A3c		200	230	500	0,40
	A3d		200	230	500	0,35
	A3e		200	230	500	0,37
	A3f		50	230	500	0,20
	A3g		62,5	230	500	0,275
A4						
	A4a	A4a.1	NS	1 000	NA	(A4a.1): 0,50
		A4a.2				(A4a.2): 0,485
	A4b		NS	750	NA	0,50
	A4c		NS	500	NA	0,50
	A4d		NS	1 000	NA	0,30
	A4e		≥ 500	750	NA	0,25
	A4f		200	490	NA	0,19
	A4g		120	490	NA	0,19
	A4h		62,5	245	NA	0,19

NOTE 1 NA = not applicable; NS = not specified.

NOTE 2 All five A1-OMx sub-categories indicated differ in bandwidth (or DMD) requirements.

NOTE 3 Most A1 sub-categories have been changed in terms of fibre designation, starting from IEC 60793-2-10:2019 (edition 7). See Table 1 of IEC 60793-2-10:2019 for cross-references to former fibre designations.

5.2 Class B – Single-mode fibres

The categories of single-mode fibres currently in use are given in Table 4.

Table 4 – Categories of glass core/glass clad single-mode fibres

Category	Type	Description
B-652	Dispersion unshifted	Dispersion unshifted single-mode fibre. Two sub-categories are recognized: B-652.B is optimised for use in the 1 310 nm region but can be used in the 1 550 nm and 1 625 nm regions. Depending on link length and bit rates, dispersion may need accommodation in the 1 550 nm region. B-652.D can be used over the extended wavelength range from 1 260 nm up to 1 625 nm. Chromatic dispersion in this band may impose requirements either on the maximum link length or the need for accommodation.
B-653	Dispersion shifted	This dispersion-shifted single-mode fibre is 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. Two sub-categories are recognized (B-653.A and B-653.B) differing in chromatic dispersion characteristics.
B-654	Cut-off shifted	This category of dispersion unshifted single-mode fibre is optimised for low loss in the 1 550 nm region. Five sub-categories are recognized (B-654.A, B-654.B, B-654.C, B-654.D and B-654.E) differing in chromatic dispersion and mode field characteristics.
B-655	Non-zero dispersion-shifted	This dispersion-shifted single-mode fibre is optimised for multiple channel transmission in the 1 550 nm region. The dispersion coefficient is required to be non-zero throughout the band from 1 530 nm to 1 565 nm, but may be either positive or negative. Depending on the dispersion characteristics, multiple channel transmission may be possible at bands either above or below the normal 1 550 nm region. Three sub-categories are recognized (B-655.C, B-655.D and B-655.E), differing in chromatic dispersion characteristics.
B-656	Wideband non-zero dispersion-shifted	This wideband non-zero dispersion-shifted single-mode fibre is 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. This fibre can be used for both CWDM and DWDM systems throughout the wavelength region between 1 460 nm and 1 625 nm.
B-657	Bending loss insensitive	This category of single-mode fibre is optimised for improved bending performance. Four sub-categories are recognized: B-657.A1 and B-657.A2 fibres are a subset of category B-652.D fibres and therefore are compliant with B-652.D fibres and have the same transmission properties. Sub-category B-657.A1 fibres are appropriate for a minimum bend radius of 10 mm; sub-category B-657.A2 fibres for a minimum bend radius of 7,5 mm. 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). Application length of B-657.B fibre, however, depends on the deployment strategy of each network operator. Sub-category B-657.B fibres are not necessarily compliant with category B-652.D fibres in terms of chromatic dispersion coefficient specifications. These fibres, however, are system compatible with B-657.A (and B-652.D) fibres in access networks. Sub-category B-657.B2 fibres are appropriate for a minimum bend radius of 7,5 mm; sub category B-657.B3 fibres for a minimum bend radius of 5 mm.
NOTE The Class B categories have been changed in fibre designation, starting from IEC 60793-2-50:2018 (edition 6). See Table 1 of IEC 60793-2-50:2018 for cross-references to former fibre designations.		

5.3 Class C – Single-mode fibres for intraconnection

The categories of single-mode fibres for intraconnection currently in use are given in Table 5.

Table 5 – Categories of glass core/glass clad single-mode fibres for intraconnection

Category	Type	Description
C1	Single-mode intraconnection fibre suitable for use with any class B single-mode fibre at wavelengths from 1 260 nm to 1 625 nm.	This category of single-mode fibre is optimised for precision glass geometry and improved macrobending, and generally having lower fibre cut-off wavelength compared to that of B-652.B fibres.
C2	Single-mode intraconnection fibre suitable for use from 1 260 nm to 1 360 nm.	This category of single-mode fibre with reduced mode field diameter is optimised for loss performance in the 1 310 nm region.
C3	Single-mode intraconnection fibre suitable for use from 1 530 nm to 1 625 nm.	This category of single-mode fibre with reduced mode field diameter is optimised for loss performance in the 1 550 nm region.
C4	Single-mode intraconnection fibre suitable for use at 980 nm.	This single-mode intraconnection fibre is intended to support 980 nm transmissions.
NOTE All four categories indicated have sub-categories based on 125 μm and 80 μm cladding diameter.		

5.4 Class D – Polarization-maintaining fibres

The categories of polarization-maintaining fibres currently in use are given in Table 6.

Table 6 – Categories of glass core/glass clad polarization-maintaining fibres

Category	Type	Description
D1	Polarization-maintaining fibre suitable for use at 980 nm	This category of polarization-maintaining fibre is optimised for polarization-maintaining ability in the 980 nm region. This fibre is used for erbium-doped fibre amplifier.
D2	Polarization-maintaining fibre suitable for use at 1 310 nm	This category of polarization-maintaining fibre is optimised for polarization-maintaining ability and connection property of category B fibres in the 1 310 nm region.
D3	Polarization-maintaining fibre suitable for use at 1 550 nm	This category of polarization-maintaining fibre is optimised for polarization-maintaining ability and connection property of category B fibres in the 1 550 nm region.

6 General requirements

6.1 Coating

Fibres with glass cladding shall be coated with a material suitable for protecting the cladding material from damage. For fibres with coatings:

a) the coating shall be in close contact with the cladding material to preserve the initial integrity of the surface;

b) the coating consists of one or more layers of the same or different materials;

c) the coating shall be removable for connecting purposes, except where it is used as a reference surface. The method of removal shall be agreed between the supplier and the customer.

6.2 Interface with the coating

The interstices between the coated fibre (when the fibre is coated) and loose buffer can be filled with a suitable fluid or easily deformable materials.

6.3 Colours of the coating

When fibre is coloured:

a) colours shall correspond as far as possible with IEC 60304, of which the following are examples: natural or white, red, yellow, blue, green, etc.;

b) a marking over the colour may be used. If used, the marking shall consist of distinctive coloured rings, lines, or helices. Printed markings shall adhere satisfactorily. Marking shall be easily identifiable with a constant repeated distance.

Annex A
(normative)

Existing multimode fibres

Table A.1 lists existing categories of multimode fibres.

Table A.1 – Existing multimode fibres

Class	Category	Sub-category	Model	Document
A: Multimode fibres				
	A1 – Graded index (glass core/glass cladding)			IEC 60793-2-10:2019
		A1-OM2	A1-OM2a and A1-OM2b	Annex A
		A1-OM3	A1-OM3a and A1-OM3b	
		A1-OM4	A1-OM4a and A1-OM4b	
		A1-OM5	A1-OM5a and A1-OM5b	
		A1-OM1		Annex B
		A1d		Annex C
	A2 – Step index (glass core/glass cladding)			IEC 60793-2-20:2015
		A2a		Annex A
		A2b		Annex B
		A2c		Annex C
	A3 – Step or graded index (glass core/plastic cladding)			IEC 60793-2-30:2015
		A3a		Annex A
		A3b		Annex B
		A3c		Annex C
		A3d		Annex D
		A3e		Annex E
		A3f		Annex F
		A3g		Annex G
	A4 – Step or graded index plastic optical fibre			IEC 60793-2-40:2015
		A4a		Annex A
			A4a.1	
			A4a.2	
		A4b		Annex B
		A4c		Annex C
		A4d		Annex D
		A4e		Annex E
		A4f		Annex F
		A4g		Annex G
		A4h		Annex H

Annex B
(normative)

Existing single-mode fibres

B.1 Existing single-mode fibres

Table B.1 lists existing categories of single-mode fibres.

Table B.1 – Existing single-mode fibres

Class	Category	Sub-category	Model	Document
B: Single-mode fibres				IEC 60793-2-50:2019
	B-652 – Dispersion unshifted			Annex A
		B-652.B		
		B-652.D		
	B-653 – Dispersion shifted			Annex B
		B-653.A		
		B-653.B		
	B-654 – Cut-off shifted			Annex C
		B-654.A		
		B-654.B		
		B-654.C		
		B-654.D		
		B-654.E		
	B-655 – Non-zero dispersion shifted			Annex D
		B-655.C		
		B-655.D		
		B-655.E		
	B-656 – Wideband non-zero dispersion shifted			Annex E
	B-657 – Bending loss insensitive			Annex F
		B-657.A		
			B-657.A1	
			B-657.A2	
		B-657.B		
			B-657.B2	
			B-657.B3	

B.2 Existing fibres for intraconnection

Table B.2 lists existing fibres for intraconnection.

Table B.2 – Existing fibres for intraconnection

Class	Category	Sub-category		Document
C: Single-mode fibres for intraconnection				IEC 60793-2-60:2008
	C1 – Suitable for use from 1 280 nm to 1 625 nm			Annex A
		C1_125		
		C1_80		
	C2 – Suitable for use in the 1 310 nm region			Annex B
		C2_125_a and C2_125_b		
		C2_80_a and C2_80_b		
	C3 – Suitable for use in the 1 550 nm region			Annex C
		C3_125_a and C3_125_b		
		C3_80_a and C3_80_b		
	C4 – Suitable for use at 980 nm			Annex D
		C4_125_a and C4_125_b		
		C4_80_a and C4_80_b		

B.3 Existing polarization-maintaining fibres

Table B.3 lists existing polarization-maintaining fibres.

Table B.3 – Existing polarization-maintaining fibres

Class	Category	Sub-category		Document
D: Polarization-maintaining fibres				IEC 60793-2-70:2017
	D1 – Suitable for use at 980 nm			Annex A
	D2 – Suitable for use at 1 310 nm			Annex B
	D3 – Suitable for use at 1 550 nm			Annex C

Bibliography

IEC 60050-731:1991, *International Electrotechnical Vocabulary – Part 731: Optical fibre communication* (available at http://www.electropedia.org)

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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FIBRES OPTIQUES –

Partie 2: Spécifications de produits – Généralités

AVANT-PROPOS

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La Norme internationale IEC 60793-2 a été établie par le sous-comité 86A: Fibres et câbles, du comité d'études 86 de l'IEC: Fibres optiques.

Cette neuvième édition annule et remplace la huitième édition parue en 2015. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) introduction des désignations révisées de la plupart des fibres de la sous-catégorie A1 et de toutes les fibres unimodales de la classe B;
b) ajout du nouveau modèle de fibre (A1-OM5) défini pour la catégorie A1;
c) ajout des fibres de maintien de la polarisation de classe D.

Le présent document doit être lu conjointement avec les parties de la série IEC 60793-1 qui traitent des mesures et essais individuels pour les attributs des fibres optiques.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
86A/1964/FDIS	86A/1974/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 60793, publiées sous le titre général *Fibres optiques*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

FIBRES OPTIQUES –

Partie 2: Spécifications de produits – Généralités

1 Domaine d'application

La présente partie de l'IEC 60793 contient les spécifications générales applicables à la fois aux fibres optiques unimodales et multimodales.

Les spécifications intermédiaires pour chacune des catégories des quatre fibres multimodales: A1, A2, A3 et A4 (parties de la classe de fibres multimodales A) contiennent des exigences spécifiques à chaque catégorie.

Les spécifications intermédiaires pour chacune des trois classes de fibres unimodales, B, C et D, contiennent des exigences communes à chaque classe.

Chaque spécification intermédiaire inclut des spécifications de famille (dans les annexes normatives) qui contiennent des exigences pour la catégorie ou les sous-catégories applicables. La distinction entre ces différentes sous-catégories se fonde sur les différents types de fibres ou les différentes applications.

Les exigences du présent document s'appliquent à toutes les classes.

Chaque spécification intermédiaire contient les exigences qui sont communes à toutes les spécifications de famille qu'elle regroupe. Ces exigences communes sont reprises dans la spécification de famille pour qu'il soit plus facile de s'y référer.

Les essais ou les méthodes de mesure sont définis pour chaque attribut spécifié. Dans la mesure du possible, ces définitions se font par référence à une Norme internationale de l'IEC (voir série IEC 60793-1). Si ce n'est pas le cas, l'essai ou la méthode de mesure est indiqué dans la spécification intermédiaire correspondante.

Le Tableau 1 définit les spécifications intermédiaires. Les spécifications de famille applicables sont définies dans les spécifications intermédiaires comme annexes normatives (voir les Tableaux 2 à 5).

Les Annexes A et B donnent une liste des spécifications de fibres existantes.

Tableau 1 – Spécifications intermédiaires

ID du document	Catégorie/classe de fibre	Matériau de la gaine	Matériau du cœur	Profil d'indice
IEC 60793-2-10	A1 multimodale	Verre	Verre	A gradient
IEC 60793-2-20	A2 multimodale	Verre	Verre	A quasi-saut ou à saut
IEC 60793-2-30	A3 multimodale	Plastique	Verre	A saut ou à gradient (à l'étude)
IEC 60793-2-40	A4 multimodale	Plastique	Plastique	A saut, à multisaut ou à gradient
IEC 60793-2-50	B unimodale	Verre	Verre	Non applicable
IEC 60793-2-60	C unimodale	Verre	Verre	Non applicable
IEC 60793-2-70	D à maintien de polarisation	Verre	Verre	Non applicable

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60304, *Couleurs de référence de l'enveloppe isolante pour câbles et fils pour basses fréquences*

IEC 60793-1 (toutes les parties), *Fibres optiques – Partie 1: Méthodes de mesure et procédures d'essai*

IEC 60793-2-10:2019, *Fibres optiques – Partie 2-10: Spécifications de produits – Spécification intermédiaire pour les fibres multimodales de catégorie A1*

IEC 60793-2-20:2015, *Fibres optiques – Partie 2-20: Spécifications de produits – Spécification intermédiaire pour les fibres multimodales de catégorie A2*

IEC 60793-2-30:2015, *Optical fibres – Part 2-30: Product specifications – Sectional specification for category A3 multimode fibres* (disponible en anglais seulement)

IEC 60793-2-40:2015, *Fibres optiques – Partie 2-40: Spécifications de produits – Spécification intermédiaire pour les fibres multimodales de la catégorie A4*

IEC 60793-2-50:2018, *Fibres optiques – Partie 2-50: Spécifications de produits – Spécification intermédiaire pour les fibres unimodales de classe B*

IEC 60793-2-60:2008, *Fibres optiques – Partie 2-60: Spécifications de produits – Spécification intermédiaire pour fibres unimodales d'intraconnexion de catégorie C*

IEC 60793-2-70:2017, *Optical fibres – Part 2-70: Product specifications – Sectional specification for polarization-maintaining fibres* (disponible en anglais seulement)

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- ISO Online browsing platform: disponible à l'adresse https://www.iso.org/obp
- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/

3.1
fibre multimodale
fibre optique dans le cœur de laquelle plusieurs modes liés peuvent être entretenus à la longueur d'onde considérée

[SOURCE: IEC 60050-731:1991, 731-02-03]

3.2
fibre unimodale
fibre optique dans laquelle un seul mode lié peut être entretenu à la longueur d'onde considérée

[SOURCE: IEC 60050-731:1991, 731-02-02, modifié – Note supprimée.]

3.3
cœur
région centrale d'une fibre optique dans laquelle la plus grande partie de l'énergie rayonnante est transmise

[SOURCE: IEC 60050-731:1991, 731-02-04]

3.4
gaine
région d'une fibre optique, constituée d'une substance diélectrique qui entoure le cœur

[SOURCE: IEC 60050-731:1991, 731-02-05]

3.5
revêtement primaire
revêtement mince appliqué directement sur la gaine d'une fibre optique, généralement au moment de l'étirement de la fibre, en une ou plusieurs couches, pour préserver l'intégrité de la surface de la gaine

Note 1 à l'article Un revêtement secondaire peut être appliqué directement sur le revêtement primaire, d'une ou de plusieurs fibres, pour renforcer la protection de la fibre optique pendant les manipulations et le câblage.

[SOURCE: IEC 60050-731:1991, 731-02-57, modifié – Les mots "généralement au moment de l'étirement de la fibre, en une ou plusieurs couches" et la Note 1 ont été ajoutés.]

3.6
matelas protecteur
protection de fibre
substance ou ensemble matériel destiné à protéger une fibre optique contre les contraintes mécaniques

[SOURCE: IEC 60050-731:1991, 731-02-56]

3.7
revêtement coloré
revêtement mince appliqué sur le revêtement primaire ou sur le revêtement secondaire afin de pouvoir distinguer chaque fibre par une couleur différente

3.8
matelas protecteur coloré
matelas protecteur appliqué sur le revêtement primaire et/ou sur le revêtement secondaire afin de pouvoir distinguer chaque fibre par une couleur différente

4 Assurance de la qualité

Il est de la responsabilité du fournisseur de mettre en place un système d'assurance de la qualité par des procédures de contrôle de la qualité, qui garantisse que le produit satisfait aux exigences du présent document, des spécifications intermédiaires et des spécifications de famille connexes. Il n'est pas prévu de réaliser un programme d'essais complet sur chaque longueur de fibre. Lorsque le client désire spécifier des essais de réception ou d'autres procédures de qualité, il est essentiel qu'un accord soit trouvé entre le client et le fournisseur au moment de la commande.

5 Construction des fibres optiques

5.1 Classe A – Fibres multimodales

Les principales catégories de fibres sont établies à partir de g, qui est le paramètre de profil d'indice de réfraction, voir Tableau 2.

Le profil d'indice normalisé est exprimé comme suit:

$$\delta(x) = 1 - x^g \tag{1}$$

où

$$\delta(x) = \frac{n(x) - n(1)}{n(0) - n(1)} \tag{2}$$

$x = \frac{r}{a}$ $(0 \le r \le a)$ est la position radiale normalisée; (3)

a est le rayon du cœur;

$n(x)$ est l'indice de réfraction au niveau de la position normalisée x.