IEC 60794-2-21

Edition 3.0 2019-04
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Optical fibre cables –
Part 2-21: Indoor ~~optical fibre~~ cables – Detailed specification for multi-fibre optical distribution cables for use in premises cabling

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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OPTICAL FIBRE CABLES –

Part 2-21: Indoor ~~optical fibre~~ cables – Detailed specification for multi-fibre optical distribution cables for use in premises cabling

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.
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8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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 60794-2-21 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition published in 2012. It constitutes a technical revision.

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

a) incorporation of the OM5 cabled fibre performance category;
b) incorporation of the OS1a cabled fibre performance category;
c) cabled fibre performance categories OM1, OM2 and OS1 are no longer normative, and are retained for information.

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

FDIS	Report on voting
86A/1925/FDIS	86A/1935RVD

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 60794 series, published under the general title *Optical fibre cables*, 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
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OPTICAL FIBRE CABLES –

Part 2-21: Indoor ~~optical fibre~~ cables – Detailed specification for multi-fibre optical distribution cables for use in premises cabling

1 Scope

This part of IEC 60794 presents the detailed requirements specific to this type of cable to ensure compatibility with the series of International Standards ISO/IEC 11801, *Information technology – Generic cabling for customer premises* (Parts 1 to 6).

The requirements of family specification IEC 60794-2-20~~:2008~~ are applicable to cables covered by this document.

Particular requirements detailed in Clause 4 define either a specific option in relation to the requirements of IEC 60794-2-20~~:2008~~ or additional requirements.

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.

~~They complete the normative references already listed in the generic specification (IEC 60794-1-1:2011 and IEC 60794-1-2:2003,) and in the sectional specification (IEC 60794-2:2002, Clause 2) or in the family specification (IEC 60794-2-20:2011, Clause 2).~~

IEC 60793-2-10:~~2007~~ —, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*[1]

IEC 60793-2-50:~~2008~~ 2018, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60794-1-1:~~2011~~ 2015, *Optical Fibre cables – Part 1-1: Generic specification – General*

~~IEC 60794-1-2:2003, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures*~~

~~IEC 60794-2:2002, *Optical fibre cables – Part 2: Indoor cables – Sectional specification*~~

IEC 60794-2-20:~~2008~~ 2013, *Optical fibre cables – Part 2-20: Indoor cables – Family specification for multi-fibre optical ~~distribution~~ cables*

[1] Edition 7 under preparation. Stage at the time of publication: IEC DECFDIS 60793-2-10:2019.

3 Terms and definitions

No terms and definitions are listed in this document.

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 General requirements

The cable shall comply with the family specification IEC 60794-2-20~~:2008~~ and meet the requirements that are defined in it.

The optical fibre contained in the cables which are covered by this document shall comply with one of the following International Standards and meet the ~~normative~~ requirements defined within them as applicable:

- ~~IEC 60793-2-50:2008, Annex A [Single-mode B1.1 fibre]~~
- ~~IEC 60793-2-50:2008, Annex C [Single-mode B1.3 fibre]~~
- ~~IEC 60793-2-50:2008, Annex G [Single-mode B6_a1 and B6_a2 fibre]~~
- ~~IEC 60793-2-10:2007, Annex A [Multimode A1a.1, 50 µm core fibre]~~
- ~~IEC 60793-2-10:2007, Annex A [Multimode A1a.2, 50 µm core fibre]~~
- ~~IEC 60793-2-10:2007, Annex A [Multimode A1a.3, 50 µm core fibre]~~
- ~~IEC 60793-2-10:2007, Annex B [Multimode A1b, 62.5 µm core fibre]~~
- IEC 60793-2-50:2018, Annex A (single-mode B-652.D fibre);
- IEC 60793-2-50:2018, Annex F (single-mode B-657 fibres);
- IEC 60793-2-10:—[2], Annex A (multimode A1-OM3 fibre);
- IEC 60793-2-10: —, Annex A (multimode A1-OM4 fibre);
- IEC 60793-2-10: —, Annex A (multimode A1-OM5 fibre).

To ensure compatibility with ISO/IEC 11801 (all parts), optical performance level requirements are presented in terms of the performance classification codes for cabled optical fibre as follows:

- ~~OS1 Single-mode fibre, B1.1, B1.3 category or sub-category B6_a1 and B6_a2;~~
- ~~OS2 Single-mode fibre, B1.3 or sub-category B6_a1 and B6_a2;~~
- ~~OM1 Multimode fibre, Model A1a.1 or sub-category A1b;~~
- ~~OM2 Multimode fibre, Model A1a.1 or sub-category A1b;~~
- ~~OM3 Multimode fibre, Model A1a.2;~~
- ~~OM4 Multimode fibre, Model A1a.3;~~
- OS1a Single-mode fibre, categories B-652.D or B-657;
- OS2 Single-mode fibre, categories B-652.D or B-657;
- OM3 Multimode fibre, A1-OM3 category;
- OM4 Multimode fibre, A1-OM4 category;

2 Editioni 7 under preparation. Stage at the time of publication: IEC DECFDIS 60793-2-10:2019.

- OM5 Multimode fibre, A1-OM5 category.

NOTE These codes are informative from the perspective of the requirements defined in this document. The OS1, OM1 and OM2 performance classification codes for cabled optical fibre are no longer normative in ISO/IEC 11801 (all parts). See ISO/IEC 11801-1:2017, Annex F, for more information.

5 Particular requirements

5.1 Fibre selection for cable testing

The fibre selection for cable testing shall be performed according to IEC 60794-1-1:~~2011~~ 2015, Annex B.

5.2 Environmental requirements – Temperature cycling

~~The cable shall meet the requirement of IEC 60794-2-20:2008, clause 4.3 Table 2, option c (–20 °C to +60 °C).~~

The cable shall be tested as per IEC 60794-2-20:2013, 4.4, and shall meet one of the following temperature ranges as per the MICE classification system:

- C_1: −10 °C to +60 °C;
- C_2: −25 °C to +70 °C:
- C_3: −40 °C to +70 °C.

The test shall be performed on a 50 m specimen.

~~No attenuation changes (according to the IEC 60794-1-1 annex B3) shall be allowed during the test.~~

The maximum increase in attenuation shall be agreed between customer and supplier.

5.3 Transmission requirements

5.3.1 Attenuation of cabled fibre

Depending on the fibre category, the attenuation coefficient of the cabled fibre shall be less than the maximum values in Table 1 for the multimode fibres and less than the maximum values in Table 2 for single-mode fibres – for the wavelengths listed in Table 2.

The fibre category shall be agreed between customer and supplier.

Table 1 – Multimode cable maximum attenuation coefficient (dB/km)

Fibre	Attenuation coefficient at 850 nm	Attenuation coefficient at 1300 nm	Performance codes
~~IEC 60793-2-10:2007, A1a.1~~	~~3,5~~	~~1,5~~	~~OM1 OM2~~
~~IEC 60793-2-10:2007, A1a.2~~	~~3,5~~	~~1,5~~	~~OM1 OM2 OM3~~
~~IEC 60793-2-10:2007, A1a.3~~	~~3,5~~	~~1,5~~	~~OM1 OM2 OM3 OM4~~
~~IEC 60793-2-10:2007, A1b~~	~~3,5~~	~~1,5~~	~~OM1 OM2~~
IEC 60793-2-10, A1-OM3	3,0	1,5	OM3
IEC 60793-2-10, A1-OM4	3,0	1,5	OM4
IEC 60793-2-10, A1-OM5	3,0	1,5	OM5

Table 2 – Single-mode cable maximum attenuation coefficient (dB/km)

Fibre ~~0~~	Wavelengths nm	Maximum attenuation coefficient	Performance codes
IEC 60793-2-50~~:2008, B1.1, B1.3, B6_a1, B6_a2~~, B-652.D and B-657	1 310, 1 383, 1 550	1,0	OS1a
IEC 60793-2-50~~:2008, B1.1, B1.3, B6_a1, B6_a2~~, B-652.D and B-657	1 310, 1 383, 1 550	0,4	OS2

5.3.2 Fibre bandwidth requirements

There are no bandwidth requirements for single-mode fibre.

For cables containing multimode fibres, the uncabled fibre shall be specified at one of performance levels defined in Table 3 in terms of minimum bandwidth (MHz·km), wavelength, and type of measurement.

The fibre category and performance level shall be agreed between customer and supplier.

Table 3 – Minimum multimode fibre bandwidth (MHz·km)

~~Fibre~~	~~Nominal core diameter (µm)~~	~~Overfilled bandwidth at 850 nm~~	~~Overfilled bandwidth at 1300 nm~~	~~Effective modal bandwidth at 850 nm*~~	~~Performance codes~~
~~IEC 60793-2-10:2007, A1a.1~~	~~50~~	~~200~~	~~500~~	~~na~~	~~OM1~~
~~IEC 60793-2-10:2007, A1a.1~~	~~50~~	~~500~~	~~500~~	~~na~~	~~OM2~~
~~IEC 60793-2-10:2007, A1a.2~~	~~50~~	~~1 500~~	~~500~~	~~2 000~~	~~OM3~~
~~IEC 60793-2-10:2007, A1a.3~~	~~50~~	~~3 500~~	~~500~~	~~4 700~~	~~OM4~~
~~IEC 60793-2-10:2007, A1b~~	~~62,5~~	~~200~~	~~500~~	~~na~~	~~OM1~~
~~IEC 60793-2-10:2007, A1b~~	~~62,5~~	~~500~~	~~500~~	~~na~~	~~OM2~~

Fibre	Nominal core diameter µm	Overfilled launch bandwidth at 850 nm	Overfilled launch bandwidth at 953 nm	Overfilled launch bandwidth at 1 300 nm	Effective modal bandwidth at 850 nm	Effective modal bandwidth at 953 nm	Performance codes
IEC 60793-2-10, A1-OM3	50	1 500	n/a	500	2 000	n/a	OM3
IEC 60793-2-10, A1-OM4	50	3 500	n/a	500	4 700	n/a	OM4
IEC 60793-2-10, A1-OM5	50	3 500	1 850	500	4 700	2 470	OM5

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IEC 60794-1-21, *Optical fibre cables – Part 1-21: Generic specification – Basic optical cable test procedures – Mechanical test methods*

IEC 60794-1-22, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental test methods*

IEC 60794-1-23, *Optical fibre cables – Part 1-23: Generic specification – Basic optical cable test procedures – Cable element test methods*

IEC 60794-2, *Optical fibre cables – Part 2: Indoor cables – Sectional specification*

IEC 60794-2-10:2011, *Optical fibre cables – Part 2-10: Indoor optical fibre cables – Family specification for simplex and duplex cables*

ISO/IEC 11801-1:2017, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

ISO/IEC 11801-2, *Information technology – Generic cabling for customer premises – Part 2: Office premises*

ISO/IEC 11801-3, *Information technology – Generic cabling for customer premises – Part 3: Industrial premises*

ISO/IEC 11801-4, *Information technology – Generic cabling for customer premises – Part 4: Single-tenant homes*

ISO/IEC 11801-5, *Information technology – Generic cabling for customer premises – Part 5: Data centres*

ISO/IEC 11801-6, *Information technology – Generic cabling for customer premises – Part 6: Distributed building services*

IEC 60794-2-21

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Optical fibre cables –
Part 2-21: Indoor cables – Detailed specification for multi-fibre optical distribution cables for use in premises cabling

Câbles à fibres optiques –
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This edition includes the following significant technical changes with respect to the previous edition:

a) incorporation of the OM5 cabled fibre performance category;
b) incorporation of the OS1a cabled fibre performance category;
c) cabled fibre performance categories OM1, OM2 and OS1 are no longer normative, and are retained for information.

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

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86A/1925/FDIS	86A/1935RVD

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.

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OPTICAL FIBRE CABLES –

Part 2-21: Indoor cables – Detailed specification for multi-fibre optical distribution cables for use in premises cabling

1 Scope

This part of IEC 60794 presents the detailed requirements specific to this type of cable to ensure compatibility with the series of International Standards ISO/IEC 11801, *Information technology – Generic cabling for customer premises* (Parts 1 to 6).

The requirements of family specification IEC 60794-2-20 are applicable to cables covered by this document.

Particular requirements detailed in Clause 4 define either a specific option in relation to the requirements of IEC 60794-2-20 or additional requirements.

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 60793-2-10:—, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*[1]

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

IEC 60794-1-1:2015, *Optical Fibre cables – Part 1-1: Generic specification – General*

IEC 60794-2-20:2013, *Optical fibre cables – Part 2-20: Indoor cables – Family specification for multi-fibre optical cables*

3 Terms and definitions

No terms and definitions are listed in this document.

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

[1] Edition 7 under preparation. Stage at the time of publication: IEC DECFDIS 60793-2-10:2019.

4 General requirements

The cable shall comply with the family specification IEC 60794-2-20 and meet the requirements that are defined in it.

The optical fibre contained in the cables which are covered by this document shall comply with one of the following International Standards and meet the requirements defined within them as applicable:

- IEC 60793-2-50:2018, Annex A (single-mode B-652.D fibre);
- IEC 60793-2-50:2018, Annex F (single-mode B-657 fibres);
- IEC 60793-2-10:—[2], Annex A (multimode A1-OM3 fibre);
- IEC 60793-2-10: —, Annex A (multimode A1-OM4 fibre);
- IEC 60793-2-10: —, Annex A (multimode A1-OM5 fibre).

To ensure compatibility with ISO/IEC 11801 (all parts), optical performance level requirements are presented in terms of the performance classification codes for cabled optical fibre as follows:

- OS1a Single-mode fibre, categories B-652.D or B-657;
- OS2 Single-mode fibre, categories B-652.D or B-657;
- OM3 Multimode fibre, A1-OM3 category;
- OM4 Multimode fibre, A1-OM4 category;
- OM5 Multimode fibre, A1-OM5 category.

NOTE These codes are informative from the perspective of the requirements defined in this document. The OS1, OM1 and OM2 performance classification codes for cabled optical fibre are no longer normative in ISO/IEC 11801 (all parts). See ISO/IEC 11801-1:2017, Annex F, for more information.

5 Particular requirements

5.1 Fibre selection for cable testing

The fibre selection for cable testing shall be performed according to IEC 60794-1-1:2015, Annex B.

5.2 Environmental requirements – Temperature cycling

The cable shall be tested as per IEC 60794-2-20:2013, 4.4, and shall meet one of the following temperature ranges as per the MICE classification system:

- C_1: −10 °C to +60 °C;
- C_2: −25 °C to +70 °C:
- C_3: −40 °C to +70 °C.

The test shall be performed on a 50 m specimen.

The maximum increase in attenuation shall be agreed between customer and supplier.

2 Editioni 7 under preparation. Stage at the time of publication: IEC DECFDIS 60793-2-10:2019.

5.3 Transmission requirements

5.3.1 Attenuation of cabled fibre

Depending on the fibre category, the attenuation coefficient of the cabled fibre shall be less than the maximum values in Table 1 for the multimode fibres and less than the maximum values in Table 2 for single-mode fibres – for the wavelengths listed in Table 2.

The fibre category shall be agreed between customer and supplier.

Table 1 – Multimode cable maximum attenuation coefficient (dB/km)

Fibre	Attenuation coefficient at 850 nm	Attenuation coefficient at 1300 nm	Performance codes
IEC 60793-2-10, A1-OM3	3,0	1,5	OM3
IEC 60793-2-10, A1-OM4	3,0	1,5	OM4
IEC 60793-2-10, A1-OM5	3,0	1,5	OM5

Table 2 – Single-mode cable maximum attenuation coefficient (dB/km)

Fibre	Wavelengths nm	Maximum attenuation coefficient	Performance codes
IEC 60793-2-50, B-652.D and B-657	1 310, 1 383, 1 550	1,0	OS1a
IEC 60793-2-50, B-652.D and B-657	1 310, 1 383, 1 550	0,4	OS2

5.3.2 Fibre bandwidth requirements

There are no bandwidth requirements for single-mode fibre.

For cables containing multimode fibres, the uncabled fibre shall be specified at one of performance levels defined in Table 3 in terms of minimum bandwidth (MHz·km), wavelength, and type of measurement.

The fibre category and performance level shall be agreed between customer and supplier.

Table 3 – Minimum multimode fibre bandwidth (MHz·km)

Fibre	Nominal core diameter µm	Overfilled launch bandwidth at 850 nm	Overfilled launch bandwidth at 953 nm	Overfilled launch bandwidth at 1 300 nm	Effective modal bandwidth at 850 nm	Effective modal bandwidth at 953 nm	Performance codes
IEC 60793-2-10, A1-OM3	50	1 500	n/a	500	2 000	n/a	OM3
IEC 60793-2-10, A1-OM4	50	3 500	n/a	500	4 700	n/a	OM4
IEC 60793-2-10, A1-OM5	50	3 500	1 850	500	4 700	2 470	OM5

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IEC 60794-1-21, *Optical fibre cables – Part 1-21: Generic specification – Basic optical cable test procedures – Mechanical test methods*

IEC 60794-1-22, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental test methods*

IEC 60794-1-23, *Optical fibre cables – Part 1-23: Generic specification – Basic optical cable test procedures – Cable element test methods*

IEC 60794-2, *Optical fibre cables – Part 2: Indoor cables – Sectional specification*

IEC 60794-2-10:2011, *Optical fibre cables – Part 2-10: Indoor optical fibre cables – Family specification for simplex and duplex cables*

ISO/IEC 11801-1:2017, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

ISO/IEC 11801-2, *Information technology – Generic cabling for customer premises – Part 2: Office premises*

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Partie 2-21: Câbles intérieurs – Spécification particulière pour les câbles optiques multifibres de distribution utilisés dans le câblage de locaux

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La présente troisième édition annule et remplace la deuxième édition parue en 2012. Elle constitue une révision technique.

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

a) l'intégration de la catégorie de performance de fibres câblées OM5;
b) l'intégration de la catégorie de performance de fibres câblées OS1a;

c) Les catégories de performance de fibres câblées OM1, OM2 et OS1 ne sont plus normatives, et sont conservées pour information.

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

FDIS	Rapport de vote
86A/1925/FDIS	86A/1935/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.

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