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INTERNATIONAL STANDARD

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Optical fibre cables –
Part 3-12: Outdoor cables – Detailed specification for duct and directly buried optical telecommunication cables for use in premises cabling

IEC 60794-3-12:2021-01 RLV(en)

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OPTICAL FIBRE CABLES –

Part 3-12: Outdoor cables – Detailed specification for duct and directly buried optical telecommunication cables for use in premises cabling

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 IEC 60794-3-12:2012. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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IEC 60794-3-12 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is an International Standard.

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

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

a) addition of references to ISO/IEC 11801-1;
b) removal of references to ISO/IEC 24702;
c) incorporation of the OM5 cabled fibre performance category;
d) incorporation of the OS1a cabled fibre performance category;
e) 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:

CDV	Report on voting
86A/2027/CDV	86A/2064/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

This International Standard is to be used in conjunction with IEC 60794-1-1, IEC 60794-1-2 and IEC 60794-3-10.

A list of all parts of 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
- amended.

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OPTICAL FIBRE CABLES –

Part 3-12: Outdoor cables – Detailed specification for duct and directly buried optical telecommunication cables for use in premises cabling

1 Scope

This part of IEC 60794 is a detailed specification for duct and directly buried optical telecommunication cables for use in premises cabling to ensure compatibility with ISO/IEC 11801-1 ~~and ISO/IEC 24702. Those standards have~~ This document's requirements ~~to~~ ensure that the ISO/IEC 11801-1 models work for generic cabling and system performances. Values in this document support these models.

The requirements of the family specification IEC 60794-3-10 are applicable to cables covered by this document. Particular requirements detailed in Clause 5 either define a specific option relative to the requirements of IEC 60794-3-10 or define 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.

~~NOTE These references complete the normative references already listed in the generic specifications IEC 60794-1-1 and IEC 60794-1-2, in the sectional specification IEC 60794-3 and in the family specification IEC 60794-3-10.~~

IEC 60793-2-10:~~2011~~2019, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

IEC 60793-2-50:~~2012~~2018, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60794-1-1, *Optical fibre cables – Part 1-1: Generic specification –* ~~*Cross reference table for optical cable test procedures*~~ *General*

IEC 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification –* ~~*Cross reference table for optical cable test procedures*~~ [1] *Basic optical cable test procedures – General guidance*

IEC 60794-3, *Optical fibre cables – Part 3: Outdoor cables – Sectional specification*

IEC 60794-3-10, *Optical fibre cables – Part 3-10: Outdoor cables – Family specification for duct, directly buried and lashed aerial optical telecommunication cables*

~~ISO/IEC 11801, Information technology – Generic cabling for customer premises~~

~~ISO/IEC 24702, Information technology – Generic cabling – Industrial premises~~

~~[1] IEC 60794-1-2:2003, Second edition has been withdrawn. A third edition, with the revised title *Optical fibre cables - Part 1-2: Generic specification - Cross reference table for optical cable test procedures*, is currently in preparation.~~

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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 60794-3-10, and meet the requirements which are defined in it, including requirements in the sectional specification, IEC 60794-3. Particular requirements detailed in Clause 5 are optional, relative to the requirements of IEC 60794-3-10, or define additional requirements.

The optical fibre contained in cables covered by this document shall comply with one of the following standards, and meet the normative requirements defined within them as applicable:

~~– IEC 60793-2-50:2008, Annex A (Single-mode fibre category B1.1);~~

~~– IEC 60793-2-50:2008, Annex C (Single-mode fibre category B1.3) ;~~

~~– IEC 60793-2-50:2008, Annex G (Single-mode fibre sub-categories B6 a1 and B6 a2)~~

~~– IEC 60793-2-10:2011, Annex A (Multimode fibre sub-category A1a, 50 µm core diameter);~~

~~– IEC 60793-2-10:2011, Annex B (Multimode fibre sub-category A1b, 62,5 µm core diameter).~~

- IEC 60793-2-50:2018, Annex A (single-mode B-652.D fibre sub-category);
- IEC 60793-2-50:2018, Annex F (single-mode B-657 fibres);
- IEC 60793-2-10:2019, Annex A (multimode fibre sub-categories A1-OM3, A1-OM4 and A1-OM5).

To ensure compatibility with the ISO/IEC 11801 series ~~and ISO/IEC 24702~~, optical performance level requirements are presented in terms of the performance classification codes for cabled optical fibre as follows:

~~– OS1 Single-mode fibre categories B1.1, B1.3 or sub-categories B6 a1, B6 a2;~~

~~– OS2 Single-mode fibre category B1.3 or sub-categories B6 a1, B6 a2;~~

~~– OM1 Multimode fibre sub-categories A1a, A1b;~~

~~– OM2 Multimode fibre sub-categories A1a, A1b;~~

~~– OM3 Multimode fibre model A1a.2;~~

~~– OM4 Multimode fibre model A1a.3.~~

- OS1a: single-mode fibre, sub-categories B-652.D or B-657;
- OS2: single-mode fibre, sub-categories B-652.D or B-657;
- OM3: multimode fibre sub-category A1-OM3;
- OM4: multimode fibre sub-category A1-OM4;
- OM5: multimode fibre sub-categoryA1-OM5.

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 (Parts 1 through 6). See ISO/IEC 11801-1:2017, Annex F, for more information.

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5 Particular requirements

5.1 General

These requirements either define a specific option relative to the requirements of IEC 60794-3-10 or define additional requirements.

5.2 MICE (mechanical, ingress, climatic and chemical and electromagnetic) characteristics

Cables intended for installation in conformity with ~~ISO/IEC 24702~~ ISO/IEC 11801-1 and related standards may require the specification of additional tests to ensure their suitability in the applicable environments defined by the mechanical, ingress, climatic and chemical and electromagnetic (MICE) classification. Such tests are outside the scope of IEC 60794 cable specifications, and MICE criteria are not part of the requirements for IEC 60794 specifications. The MICE tests may be the same as, similar to, or substantially different from, the tests required by IEC 60794 specifications, specifically those in IEC 60794-1-21, IEC 60794-1-22 and IEC 60794-1-23. Cables manufactured per IEC 60794 specifications, may or may not meet the MICE criteria. For supplemental discussion, see IEC TR 62362 ~~[1]~~[2].

5.3 Transmission requirements

5.3.1 Attenuation of cabled fibre

Depending on the fibre ~~type~~ 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 ~~as stated in Tables 1 and 2~~ listed in Table 2.

The fibre category~~, sub-category or model as applicable~~ and performance level shall be agreed between customer and supplier.

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

~~Fibre~~	~~Attenuation coefficient at 850 nm~~	~~Attenuation coefficient at 1 300 nm~~	~~Performance code~~
~~IEC 60793-2-10:2011, A1a.1~~	~~3,5~~	~~1,5~~	~~OM1, OM2~~
~~IEC 60793-2-10:2011, A1a.2~~	~~3,5~~	~~1,5~~	~~OM1, OM2, OM3~~
~~IEC 60793-2-10:2011, A1a.3~~	~~3,5~~	~~1,5~~	~~OM1, OM2, OM3, OM4~~
~~IEC 60793-2-10:2011, A1b~~	~~3,5~~	~~1,5~~	~~OM1, OM2~~

Fibre	Attenuation coefficient at 850 nm	Attenuation coefficient at 1 300 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

~~2 Numbers in square brackets refer to the Bibliography.~~

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

~~Fibre~~	~~Wavelengths nm~~	~~Maximum attenuation coefficient~~	~~Performance code~~
~~IEC 60793-2-50:2008, B1.1, B1.3, B6 a1 or B6 a2~~	~~1 310, 1 550~~	~~1,0~~	~~OS1~~
~~IEC 60793-2-50:2008, B1.3, B6 a1 or B6 a2~~	~~1 310, 1 383, 1 550~~	~~0,4~~	~~OS2~~

Fibre	Wavelengths nm	Maximum attenuation coefficient	Performance codes
IEC 60793-2-50, B-652.D ,B-657.A1, B-657.A2, B-657.B2, B-657.B3	1 310, 1 383, 1 550	1,0	OS1a
	1 310, 1 383, 1 550	0,4	OS2

~~NOTE Optical fibre B6 a is recommended when it is expected that the optical fibre or the cable will have to support smaller bend radii than 25 mm.~~

5.3.2 Fibre bandwidth requirements

There are no bandwidth requirements on single-mode fibre.

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

The fibre category~~, sub-category or model as applicable~~ and performance level shall be agreed between customer and supplier.

Table 3 – ~~Minimum~~ Multimode fibre minimum bandwidth (MHz·km)

~~Fibre~~	~~Nominal core diameter µm~~	~~Overfilled bandwidth at 850 nm~~	~~Overfilled bandwidth at 1 300 nm~~	~~Effective modal bandwidth at 850 nm~~	~~Performance code~~
~~IEC 60793-2-10:2011, A1a.1~~	~~50~~	~~200~~	~~500~~	~~N/A~~	~~OM1~~
~~IEC 60793-2-10:2011, A1a.1~~	~~50~~	~~500~~	~~500~~	~~N/A~~	~~OM2~~
~~IEC 60793-2-10:2011, A1a.2~~	~~50~~	~~1 500~~	~~500~~	~~2 000~~	~~OM3~~
~~IEC 60793-2-10:2011, A1a.3~~	~~50~~	~~3 500~~	~~500~~	~~4 700~~	~~OM4~~
~~IEC 60793-2-10:2011, A1b~~	~~62,5~~	~~200~~	~~500~~	~~N/A~~	~~OM1~~
~~IEC 60793-2-10:2011, A1b~~	~~62,5~~	~~500~~	~~500~~	~~N/A~~	~~OM2~~
~~N/A Not applicable.~~					

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[a]	Effective modal bandwidth at 953 nm[a]	Performance codes
IEC 60793-2-10, A1-OM3	50	1 500	n/a	500	2 000	not specified	OM3
IEC 60793-2-10, A1-OM4	50	3 500	n/a	500	4 700	not specified	OM4
IEC 60793-2-10, A1-OM5	50	3 500	1 850	500	4 700	2 470	OM5

[a] Effective modal bandwidth guidance is provided at all wavelengths in the 840 nm to 953 nm range in IEC 60793-2-10. For OM3, the guidance is 1 033 MHz·km at 953 nm. For OM4, the guidance is 1 459 MHz·km at 953 nm.

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