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Optical fibre cables –
Part 2-20: Indoor cables – Family specification for multi-fibre optical cables

IEC 60794-2-20:2024-12 RLV(en)

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OPTICAL FIBRE CABLES –

Part 2-20: Indoor cables – Family specification for multi-fibre optical cables

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 60794-2-20:2013. 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 60794-2-20 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2013. This edition constitutes a technical revision.

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

a) update of the normative references;
b) review update of parameters and requirements for mechanical tests and environmental tests, maintaining alignment with additional relevant standards in the IEC 60794-2 series;
c) addition of cabled fibre attenuation requirements;
d) addition of cable design examples.

This document is to be used in conjunction with IEC 60794-1-1:2023, IEC 60794-1-2:2021, IEC 60794-1-21:2015 and IEC 60794-1-21:2015/AMD:2020, IEC 60794-1-22:2017, IEC 60794-1-23:2019 and IEC 60794-2:2017.

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

Draft	Report on voting
86A/2431/FDIS	86A/2520/RVD

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

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

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

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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

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OPTICAL FIBRE CABLES –

Part 2-20: Indoor cables – Family specification for multi-fibre optical cables

1 Scope

This part of IEC 60794 is a family specification covering multi-fibre optical cables for indoor use. The requirements of the sectional specification IEC 60794-2 are applicable to cables covered by this document. Annex B contains a blank detail specification and general guidance in case the cables are intended to be used in installations governed by the MICE table of ~~ISO/IEC 24702 (Industrial premises) [11]~~[1] ISO/IEC 11801-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~NOTE These reference complete the normative references already listed in the generic specification (IEC 60794-1-1 and IEC 60794-1-2).~~

~~IEC 60189-1, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*~~

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

IEC 60793-1-20, *Optical fibres – Part 1-20: Measurement methods and test procedures – Fibre geometry*

IEC 60793-1-21, *Optical fibres – Part 1-21: Measurement methods and test procedures – Coating geometry*

IEC 60793-1-40, *Optical fibres – Part 1-40: Attenuation measurement methods*

IEC 60793-1-44, *Optical fibres – Part 1-44: Measurement methods and test procedures – Cut-off wavelength*

IEC 60793-1-46, *Optical fibres – Part 1-46: Measurement methods and test procedures – Monitoring of changes in optical transmittance*

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

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

IEC 60794-1-1:2023, *Optical fibre cables – Part 1-1: Generic specification – General*

~~1 Figures in square brackets refer to the Bibliography.~~

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IEC 60794-1-2:2021, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures – General guidance*

~~IEC 60794-1-20, *Optical fibre cables – Part 1-20: Generic specification – Basic optical cable test procedures – General and definitions*[2]~~

IEC 60794-1-21:2015, *Optical fibre cables – Part 1-21: Generic specification – Basic optical cable test procedures – Mechanical test methods*
IEC 60794-1-21:2015/AMD1:2020

IEC 60794-1-22:2017, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental test methods*

IEC 60794-1-23:2019, *Optical fibre cables – Part 1-23: Generic specification – Basic optical cable test procedures – Cable element test methods*

IEC 60794-1-31, *Optical fibre cables – Part 1-31: Generic specification – Optical cable elements – Optical fibre ribbon*

IEC 60794-2:~~2002~~2017, *Optical fibre cables – Part 2: Indoor cables – Sectional specification*

~~IEC 60794-3:2001, *Optical fibre cables – Part 3: Sectional specification – Outdoor cables*~~

IEC 60811-202, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath*

IEC 60811-203, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 203: General tests – Measurement of overall dimensions*~~.~~

~~IEC 60811-504, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 504: Mechanical tests – Bending tests at low temperature for insulation and sheaths*~~

~~IEC/TR 62222, *Fire performance of communication cables installed in buildings*~~

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60794-1-1 apply.

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

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

4 Construction

4.1 General

In addition to the constructional requirements in IEC 60794-2, the following considerations apply to multi-fibre indoor cables.

The cable shall be designed and manufactured for an expected operating lifetime of at least 15 years. In this context, the attenuation at the operational wavelength(s) of the optical fibres

~~2 To be published.~~

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contained in the installed cable shall not exceed values ~~agreed between customer and supplier~~ specified in 5.5. The materials in the cable shall not present a health or environmental hazard within its intended use.

Optical elements may comprise any of the cable elements described in 4.3 to 4.8 or in IEC 60794-1-3.

There shall be no fibre splice in a delivery length unless otherwise agreed by customer and supplier.

It shall be possible to identify each individual fibre throughout the length of the cable.

4.2 Optical fibres

~~Class A1 multimode fibres which meet the requirements of IEC 60793-2-10 or class B sub-categories B1.1, B1.3, B6_a, and B6_b single-mode optical fibres which meet the requirements of IEC 60793-2-50 shall be used. The linear coefficient of optical fibre attenuation and attenuation point discontinuity may be affected by the cable manufacturing process. Maximum values for these optical characteristics shall be agreed between customer and supplier.~~

Multimode or single-mode optical fibres meeting the requirements of IEC 60793-2-10 sub-categories A1-OM1 to A1-OM5 or IEC 60793-2-50 categories B-652 and B-657 shall be used. The linear coefficient of optical fibre attenuation and attenuation point discontinuity may be affected by the cable manufacturing process. Maximum values for these optical characteristics shall be as specified in 5.5.

4.3 Buffer

If a ~~tight or semi-tight (loosely applied)~~ buffer is required, it shall consist of one or more layers of inert material. The buffer shall be easily removable. For tight buffers, the buffer and fibre primary coating shall be removable in one operation over a minimum length of 15 mm ~~to 25 mm~~, depending on customer requirements. For semi-tight buffers, the buffer shall be easily removable over a minimum length of ~~0,3 m to 2,0 m~~ 300 mm. For loose buffers, the buffer shall be easily removable over a length of not less than 1,0 m. Buffer dimensions are shown in Table 1.

Table 1 – Dimensions of buffered fibres

Buffer type	Nominal diameter mm	Tolerances mm
Semi-tight or loose buffer	0,3 to ~~1,4~~ 1,3	±0,05
Tight buffer	0,3 to 1,0	±0,05

4.4 Ruggedized fibre

Further protection can be provided to tight or semi-tight buffered fibres by surrounding them with non-metallic strength members within a sheath of suitable material.

4.5 Slotted core

The slotted core is obtained by extruding a suitable material with a defined number of slots, providing helical or SZ (reverse-oscillating lay) configuration along the core. One or more primary coated fibres or optical elements such as ribbons or fibre bundles are located in each slot.

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4.6 Tube

One or more primary coated or buffered fibres or ribbons are packaged (loosely or not) in a tube construction which may be filled. The tube may be reinforced with a composite wall. The polymeric tube may be hard, to provide some crush protection to the fibre bundle or soft to enable easy stripability of the tube without specialized tools.

4.7 Stranded tube

Multiple tubes, containing one or more primary coated or buffered fibres or ribbons, ~~are~~ may be:

- stranded around a central member,
- non-stranded, or
- homogeneous optical tubes stranded using helical or SZ configurations.

For the sake of preserving cable geometry, some tubes may be "filler" or "empty" elements not containing optical fibres.

4.8 Ribbon structure

Ribbon structures shall conform to ~~6.5 and 8.2.3 of IEC 60794-3:2001~~ IEC 60794-1-31. Fibres shall be arranged to be parallel and formed into ribbons so that the fibres remain parallel and do not cross over.

Partially bonded ribbon structures enable the optical fibre ribbon to be rolled up easily and accommodated very tightly in cables. Unless otherwise specified, each ribbon shall be uniquely identified with a printed legend or by uniquely colouring the reference fibre and/or by colouring the matrix material of the ribbon.

4.9 Strength and anti-buckling members

The cable shall be designed with sufficient strength members to meet installation and service conditions so that the fibres are not subjected to strain in excess of limits ~~agreed between customer and supplier~~ specified in 5.3.1.

The strength and~~/or~~ anti-buckling members may be either metallic or non-metallic and may be located in the cable core ~~and/~~or under the sheath ~~and/~~or in the sheath.

4.10 Ripcord

If required, a ripcord may be provided beneath the sheath.

4.11 Sheath

The cable shall have an overall protective sheath. The cable diameter shall be specified in the relevant blank detail specification (or product) specification.

4.12 Sheath marking

If required, the cable shall be marked as agreed between customer and supplier. The marking can include identifying marks regarding the manufacturer, fire resistance ratings, jacket length, date of manufacture, etc.

4.13 Identification

Optical fibres, buffers and sub-unit sheaths shall be easily and uniquely identifiable through the use of a suitable colour code according to IEC 60304 and/or an easily visible numbering scheme to be agreed between customer and supplier.

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4.14 Examples of cable constructions

Examples of some ~~main~~ types of cable construction are shown in Annex A. Other configurations (e.g. multi-layer constructions) are not precluded if they meet the mechanical, environmental and transmission requirements given in this document.

5 Tests

5.1 General

Compliance with relevant detail specification requirements shall be verified by carrying out tests selected from 5.2 to 5.6. It is not intended that all tests be carried out; the frequency of testing shall be agreed between customer and supplier.

~~Unless otherwise specified, all tests shall be carried out at room temperature: (23 ± 5) °C.~~

~~Attenuation measurements shall be conducted at the highest specified wavelength.~~

~~Some of the following tests can be performed on a short sample length of cable which is still an integral part of a longer length. Thus it becomes possible to detect permanent changes in attenuation within the measurement uncertainty of the equipment used (see 4.8.2, Assessment of uncertainties in IEC 60794-1-20:201X). The wavelength and maximum value of this attenuation change shall be agreed between customer and supplier.~~

Unless otherwise specified, all tests shall be carried out at standard atmospheric conditions according to IEC 60794-1-2. These tests are not intended to define end-of-life performance.

The attenuation of cabled fibres shall be as specified in 5.5.

Measurements of attenuation shall be carried out according to IEC 60793-1-40. Change in attenuation measurements shall be carried out according to IEC 60793-1-46.

NOTE The optimized wavelength for multimode fibre sub-categories A1-OM3 and A1-OM4 is 850 nm and for A1-OM5 fibre, the targeted operational wavelength(s) is between 850 nm and 950 nm.

5.2 Dimensions

The fibre dimensions and tolerances shall be checked in accordance with the test method ~~C of~~ as specified in IEC 60793-1-20 or IEC 60793-1-21. The diameter of the buffer and of the cable, as well as the thickness of the sheath, shall be measured in accordance with the methods of ~~IEC 60189-1~~ IEC 60811-202 and IEC 60811-203.

5.3 Mechanical requirements

5.3.1 ~~Cable~~ Tensile performance

Method:	IEC 60794-1-21 ~~E1A and/or E1B [4]~~, method E1
Diameter of chuck drums and transfer devices:	not smaller than the minimum bending diameter specified for the cable under load
Velocity of transfer device:	either 100 mm/min or 100 N/min
Load and duration:	400 N or 9,8 × the ~~weight~~ mass of 1 km of cable, whichever is greater,and for a minimum period of ~~5~~10 min
Length of sample:	≥ 50 m and sufficient to achieve the desired accuracy of measurement of attenuation change ~~(typically 300 m) and shall be agreed between customer and supplier~~

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Requirements: ~~for E1A there shall be no change in attenuation after the test~~

~~for E1B allowed fibre strain to be agreed between supplier and customer~~

there shall be no change in attenuation after the test; there shall be no visible damage to the cable elements

~~Fibre strain above 60 % of the proof test of the all-glass fibre while under test load is not recommended.~~

The fibre strain shall be less than 60 % of the proof test level of the fibre.

~~NOTE~~ For certain applications specifying MICE classification of ISO/IEC ~~24702~~ 11801-1 and related standards, different load and duration values may be agreed between customer and supplier.

For exceptionally high fibre count cables, different load values may be agreed between customer and supplier.

5.3.2 ~~Cable~~ Crush

Method: IEC 60794-1-21 ~~E3~~, method E3A

~~Force during installation: 500 N~~

~~Duration during installation: 1 min~~

~~Force during operation: 300 N~~

~~Duration during operation: 15 min~~

~~Length between test locations: 500 mm~~

Total force applied (short term): 500 N

Duration of application of the force: 1 min

Number of tests: 3

Spacing between test places: 500 mm

Requirements: no change in attenuation during the operational test and after the installation test; there shall be no visible damage to the cable elements

NOTE For certain applications specifying MICE classification of ISO/IEC ~~24702~~ 11801-1 and related standards, different force values ~~may~~ can be agreed between customer and supplier.

5.3.3 ~~Cable~~ Impact

Method: IEC 60794-1-21 ~~-~~, method E4

Radius of striking surface: ~~12,5~~ 300 mm

Impact energy: 1,0 J

Number of impacts: at least 3, each separated at least 500 mm

Requirements: no fibre breakage

NOTE For certain applications specifying MICE classification of ISO/IEC ~~24702~~ 11801-1 and related standards, impact energy values ~~may~~ can be agreed between customer and supplier.

5.3.4 ~~Cable~~ Bending

Method: IEC 60794-1-21 ~~-~~, method E11A

Mandrel diameter: 20 times cable diameter

Number of turns ~~per helix~~: 6

Number of cycles: 10

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Requirements: no fibre breakage

NOTE For certain applications specifying MICE classification of ISO/IEC ~~24702~~ 11801-1 and related standards, different mandrel diameter values ~~may~~ can be agreed between customer and supplier.

5.3.5 ~~Cable~~ Repeated bending

Method: IEC 60794-1-21~~-~~, method E6

Bending radius: 20 times cable diameter

Number of cycles: 25

Mass of weights: sufficient to minimize specimen sag or bend – typically 4 kg

Requirements: under visual examination without magnification, there shall be no damage to the sheath and to the cable elements

5.3.6 ~~Cable~~ Bending under tension

Method: IEC 60794-1-21 ~~E18~~, method E18A

Bending radius: 20 times cable diameter

Load: 400 N or weight of 1 km of cable, whichever is greater

Requirements: no change in attenuation after the test, and
there shall be no visible damage to the cable elements

5.3.7 ~~Cable~~ Bending at low temperature

Method: IEC 60794-1-21~~-~~, method E11A ~~(see IEC 60811-504)~~

Bending radius: 10 times cable diameter

Test temperature: 0 °C, −10 °C or −15 °C depending on application and customer requirements

Number of turns ~~per helix~~: ~~according to IEC 60811-504~~ 4

Number of cycles: 2

Requirements: ~~in addition to the requirements of IEC 60811-504,~~ no visible damage to cable sheath, and no fibre shall break during the test

5.3.8 ~~Cable~~ Flexing

Method: IEC 60794-1-21~~-~~, method E8

Number of cycles: 100

Pulley diameter: 20 times cable diameter

Mass of weights: 2 kg (minimum)

Requirements: no fibre breakage

NOTE For certain applications specifying MICE classification of ISO/IEC ~~24702~~ 11801-1 and related standards, different pulley diameter values ~~may~~ can be agreed between customer and supplier.

5.3.9 ~~Cable~~ Torsion

Method: IEC 60794-1-21~~-~~, method E7

Number of cycles: 10

Distance between fixed and rotation clamp: 125 times cable diameter but not more than 2,0 m

Tension load: 20 N

Requirements: no fibre breakage

NOTE For certain applications specifying MICE classification of ISO/IEC ~~24702~~ 11801-1 and related standards, different values for the number of cycles ~~may~~ can be agreed between customer and supplier.

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5.3.10 Cable Kink

Method: IEC 60794-1-21-, method E10

Minimum loop diameter: 20 times cable diameter

Requirement: no kink shall occur

5.4 Environmental requirements – Temperature cycling

For indoor multi-fibre cables, −10 °C and +60 °C are the recommended low and high temperatures. Based on different environment classifications, other operating temperatures may be agreed upon between customer and supplier. Table 2 gives the operating temperature limits based on environmental classification.

~~**Table 2 – Sample temperature cycling values**~~

	~~*Low temperature TA*~~	~~*High temperature TB*~~
~~a)*~~	~~0 °C~~	~~+50 °C~~
~~b)~~	~~–5 °C~~	~~+50 °C~~
~~c)~~	~~–20 °C~~	~~+60 °C~~
~~d)~~	~~–40 °C~~	~~+60 °C~~
~~* Condition a), b) c) or d) shall be selected depending on application and customer requirements, for example condition c) is appropriate for applications to ISO/IEC 11801 [10].~~		

Table 2 – Typical values for temperature cycling

Low temperature TA2 °C	High temperature TB2 °C	Sources of temperature limits	
		Performance categories of connectors, components and protective housings [a]	Environmental classification of customer premises cabling [b]
−10	+60	C (recommended)	$M_xI_xC1E_x$
−25	+70	OP	$M_xI_xC2E_x$
−40	+70	I	$M_xI_xC3E_x$

A suitable operating service environment (performance category) or environmental classification should be selected according to the application. A complete list of operating service environments can be found in IEC 60794-1-1:2023.

[a] Included in IEC 61753-1. The abbreviations represent:

C: indoor controlled environment;

OP: outdoor protected environment;

I: industrial environment.

[b] Included in ISO/IEC 11801-1. For an introduction to the MICE environmental classification system, use ISO/IEC TR 29106. The abbreviation MICE represents: mechanical, ingress, climatic, electromagnetic.

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Method:	IEC 60794-1-22-, method F1
Period:	t_1 = sufficient time such that the cable has reached thermal stability throughout its entire length at the specified temperature ~~(e.g. 8 h ≤ t_1 ≤ 24 h)~~ (for additional information, see IEC 60794-1-22:2017, Table 1 in method F1)
Number of cycles:	2
Length of sample:	sufficient to achieve the desired accuracy of measurement of attenuation
Requirements:	~~the wavelength and maximum increase in attenuation both at T_A and T_B and after returning to thermal stability at ambient temperature shall be agreed between the customer and supplier~~ the maximum change in attenuation during the test shall be specified in the relevant detail specification; there shall be no change in attenuation after the test.

5.5 Transmission requirements

5.5.1 General

The transmission requirements shall be ~~verified~~ in accordance with one of the sectional specifications defined in IEC 60793-2-10 or IEC 60793-2-50 ~~and shall be agreed between customer and supplier~~. Maximum cabled fibre attenuation shall comply with ~~values stated in the relevant detail specification~~ this document.

5.5.2 Single-mode optical fibres

See Table 3.

Table 3 – Common single-mode optical fibre requirements

Characteristics	IEC 60794-2:2017, Subclause no.	Requirements	Test methods	Remarks
Uncabled optical fibre	4.2	IEC 60793-2-50		
Cabled fibre cut-off wavelength	4.2	$\lambda_{cc} < \lambda$ operational	IEC 60793-1-44	
Point discontinuities at 1 550 nm	4.2	≤ 0,10 dB	IEC 60793-1-40	

5.5.3 Single-mode dispersion unshifted (B-652.B) optical fibre

See Table 4.

Table 4 – Cabled fibre attenuation requirements for B-652.B optical fibre

Characteristics	IEC 60794-2:2017, Subclause no.	Requirements	Test methods	Remarks
Attenuation coefficient (cabled fibres)	7.3	According to the Detail Specification	IEC 60793-1-40	
at 1 310 nm at 1 550 nm at 1 625 nm		≤ 1,0 dB/km ≤ 1,0 dB/km ≤ 1,0 dB/km		

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5.5.4 Single-mode dispersion unshifted (B-652.D) optical fibre

See Table 5.

Table 5 – Cabled fibre attenuation requirements for B-652.D optical fibre

Characteristics	IEC 60794-2:2017, Subclause no.	Requirements	Test methods	Remarks
Attenuation coefficient (cabled fibres)	7.3	According to the Detail Specification	IEC 60793-1-40	
at 1 310 nm to 1 625 nm at 1 383 nm at 1 550 nm		≤ 1,0 dB/km ≤ 1,0 dB/km ≤ 1,0 dB/km		

5.5.5 Single-mode (B-657.A) optical fibre

See Table 6.

Table 6 – Cabled fibre attenuation requirements for B-657.A optical fibre

Characteristics	IEC 60794-2:2017, Subclause no.	Requirements	Test methods	Remarks
Attenuation coefficient (cabled fibres)	7.3	According to the Detail Specification	IEC 60793-1-40	
at 1 310 nm to 1 625 nm at 1 383 nm at 1 550 nm		≤ 1,0 dB/km ≤ 1,0 dB/km ≤ 1,0 dB/km		

5.5.6 Single-mode (B-657.B) optical fibre

See Table 7.

Table 7 – Cabled fibre attenuation requirements for B-657.B optical fibre

Characteristics	IEC 60794-2:2017, Subclause no.	Requirements	Test methods	Remarks
Attenuation coefficient (cabled fibres)	7.3	According to the Detail Specification	IEC 60793-1-40	
At 1 310 nm At 1 550 nm At 1 625 nm		< 1,0 dB/km < 1,0 dB/km < 1,0 dB/km		

5.5.7 Multimode optical fibres

See Table 8.

Table 8 – Common multimode optical fibre requirements

Characteristics	IEC 60794-2:2017, Subclause no.	Requirements	Test methods	Remarks
Uncabled optical fibre	4.2	IEC 60793-2-10		
Point discontinuities at 850 nm and 1 300 nm	4.2	≤ 0,10 dB	IEC 60793-1-40	

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5.5.8 Multimode (A1-OM1 to A1-OM5) optical fibres

See Table 9.

Table 9 – Cabled fibre attenuation requirements for A1-OM1 to A1-OM5 optical fibres

Characteristics	IEC 60794-2:2017, Subclause no.	Requirements	Test methods	Remarks
Attenuation coefficient (cabled fibres)	7.3	According to the Detail Specification	IEC 60793-1-40	
at 850 nm at 1 300 nm		3,0 dB/km 1,5 dB/km		

5.6 Fire performance

IEC TR 62222 provides guidance and recommendations for the requirements and test methods ~~to be specified~~ for the fire performance of communication cables when installed in buildings. The recommendations relate to typical applications and installation practices, and an assessment of the fire hazards presented. Account is also taken of applicable legislation and regulation.

~~The recommendations relate to typical applications and installation practices and also take into account legislation and regulation applicable to the fire performance of cables that govern the tests to be performed.~~

~~Tests to be performed shall be agreed between the customer and the supplier.~~

IEC TR 62222 references several IEC fire performance test methods and also other test methods that can be required by local or national legislation and regulation. The tests to be applied, and the requirements, shall be agreed between the customer and supplier taking into account the fire hazard presented by the end use application in which the cable is intended to be used.

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Annex A
(informative)

Examples of cable constructions

Figure A.1 to ~~Figure A.9~~ Figure A.10 provide examples of cable constructions.

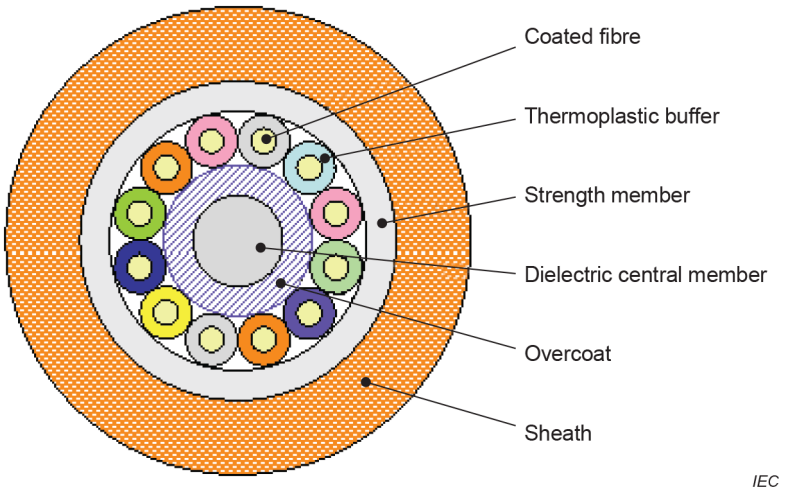

Figure A.1 – Example of cross-section of a 12-fibre cable

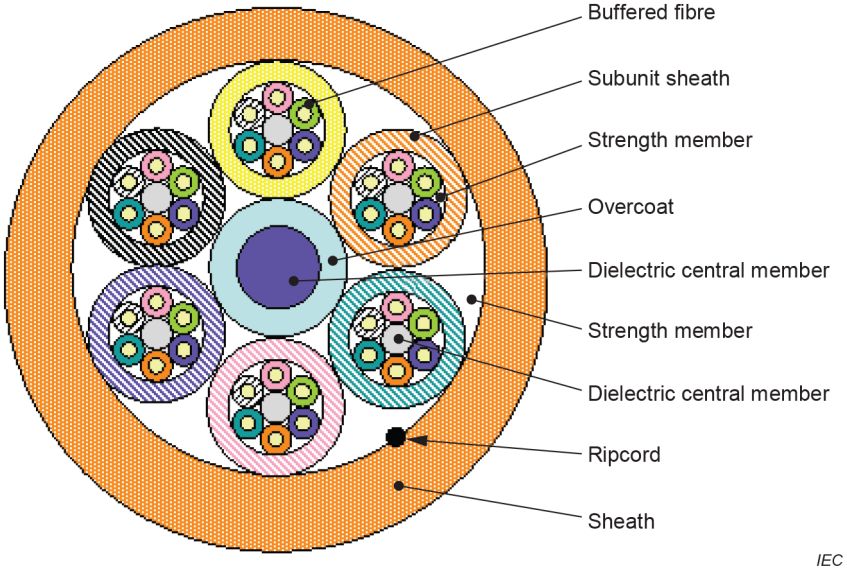

Figure A.2 – Example of cross-section of a 36-fibre cable

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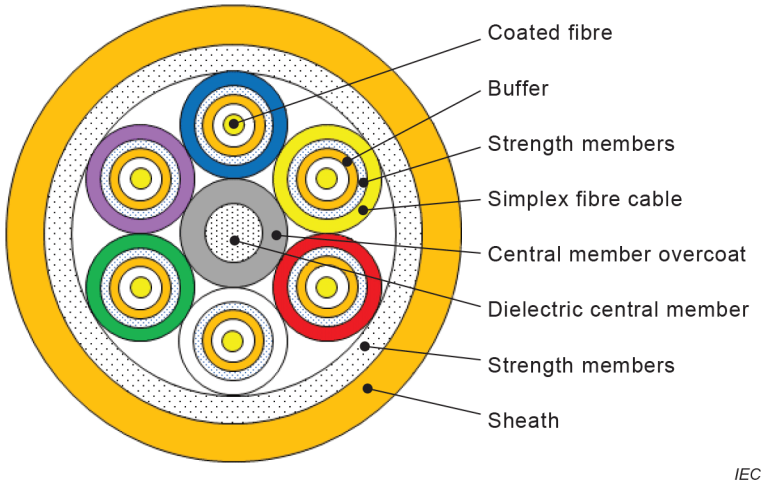

Figure A.3 – Example of cross-section of a 6-fibre break-out cable

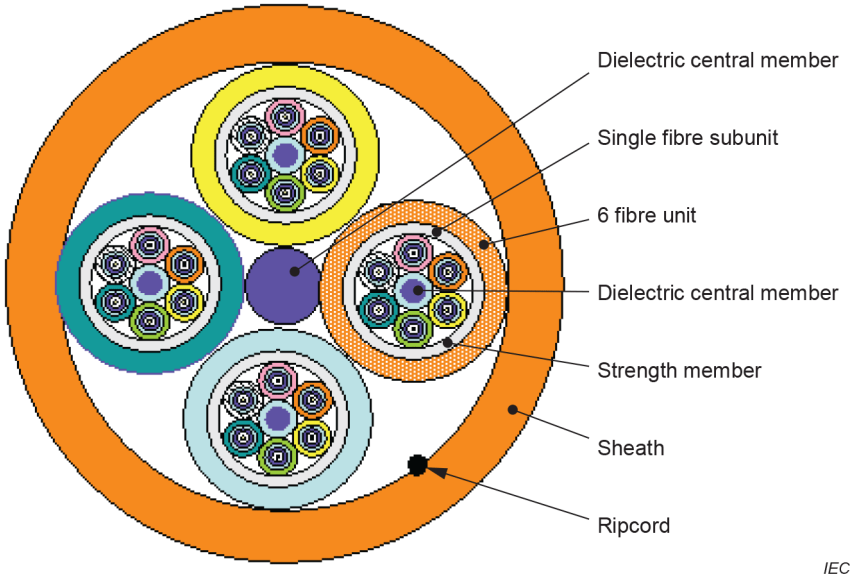

Figure A.4 – Example of cross-section of a 24-fibre break-out cable

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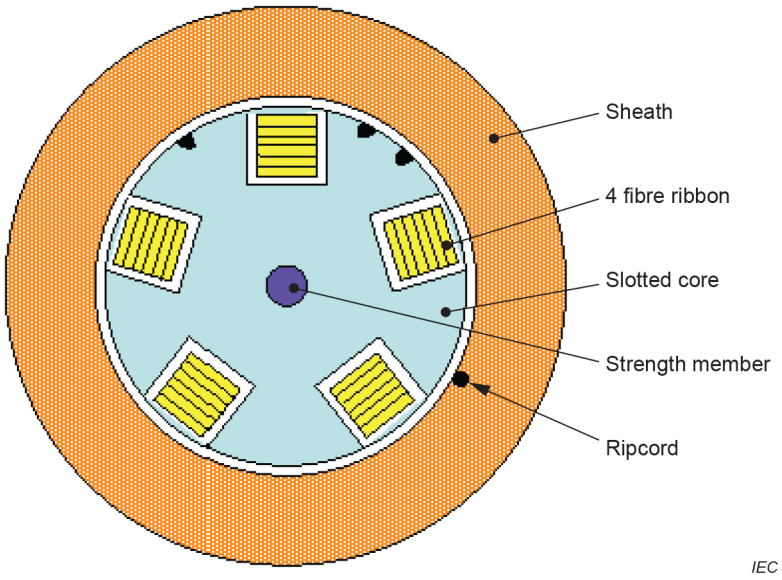

Figure A.5 – Example of cross-section of a slotted core type indoor cable with 4-fibre ribbons

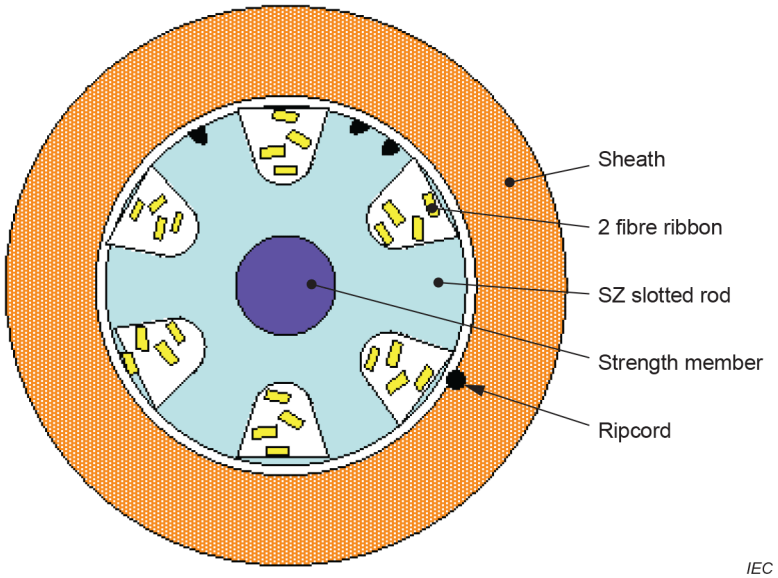

Figure A.6 – Example of cross-section of an SZ (reverse oscillating lay) slotted core type indoor cable with 2-fibre ribbons

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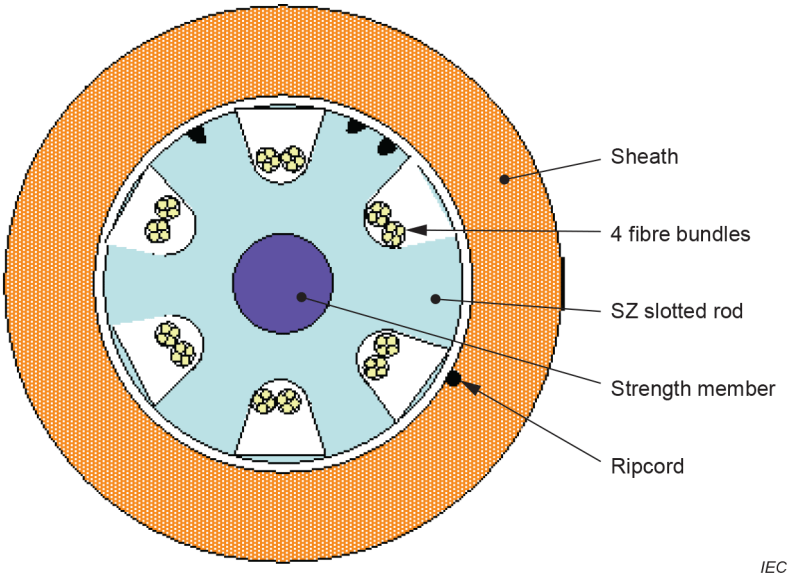

Figure A.7 – Example of cross-section of an SZ (reverse oscillating lay) slotted core type indoor cable with 4-fibre bundles

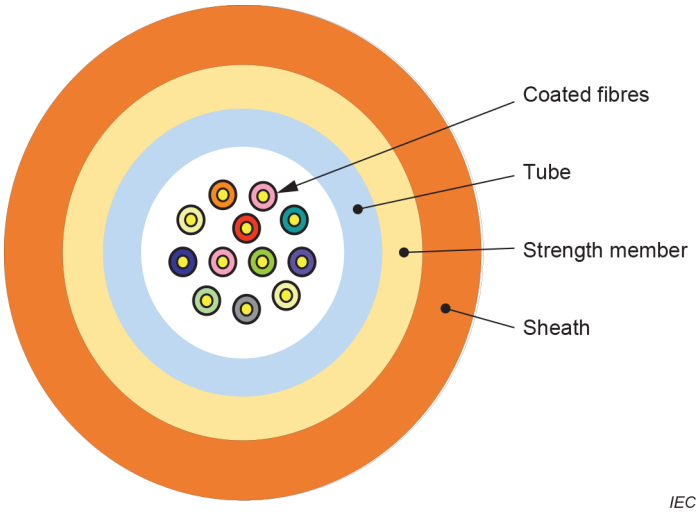

Figure A.8 – Example of multi-fibre unitube cable

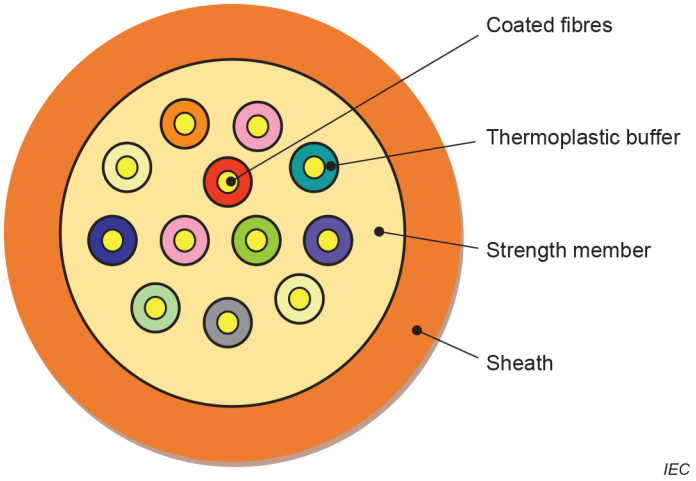

Figure A.9 – Example of multi-fibre cable

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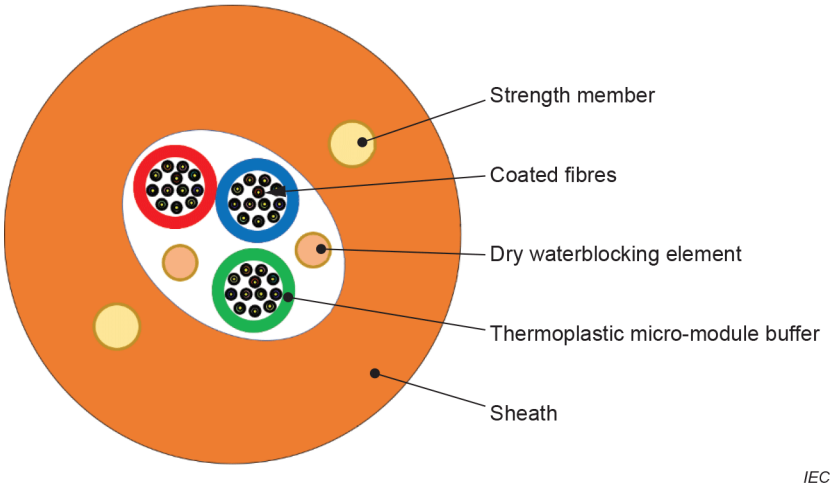

Figure A.10 – Example of a retractable (micro-module) cable

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Annex B
(informative)

Family specification for multi-fibre optical cables – Blank detail specification and minimum requirements

B.1 Blank detail specification

B.1.1 General

See Table B.1 to Table B.5 for blank detail specifications and minimum requirements.

B.1.2 Cable description

Table B.1 – Cable description

(1) Prepared by		(2) Document no: Issue: Date:
(3) Available from	(4) Generic specification: Sectional specification:	IEC 60794-1-1 IEC 60794-2
(5) Additional references: ISO/IEC ~~24702~~11801-1 if required		
(6) Cable description:		
(7) Cable construction:		
Optical fibres		
Range of fibre count		
Modularity		
Construction – single coloured fibre – tube – filled – tube – unfilled – slotted core – filled – slotted core – unfilled – tight, semi-tight or loose buffer – ribbon in slotted core – ribbon in tube – strength elements – non metallic – strength elements – metallic		Additional remarks
Lay-up – stranding (helical or reverse oscillating/SZ) – single unit – hybrid configuration – other		
~~Insulated copper conductors~~ ~~– AWG~~ ~~– solid/stranded~~ ~~– insulation material~~		

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Inner sheath – material – minimum wall thickness	
Peripheral strength member – metallic – non-metallic	
Outer sheath – material – minimum wall thickness	
~~Additional armouring~~ ~~– non-metallic armouring~~ ~~– metallic armouring~~	
Marking identification – customer requirement – identification of supplier	
(8) Application information:	
Application	
Maximum outer diameter (d)	mm
Rated maximum tensile load	N
Minimum bending radius for operation	mm or nxd
Minimum bending radius under load	mm or nxd
Temperature range:	
– transport and storage	°C
– installation	°C
– operation	°C
Manufacturing cable length	
– typical	m
– nominal/tolerances:	$^{+1}_{0}$ %

B.1.3 Cable element

Table B.2 – Cable element

Characteristics (9)	IEC 60794-2:2017 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Cable element				
Tight, semi-tight or loose buffer				
Slotted core				
Tube				
Compound flow and evaporation				
Outer diameter				
Ribbon				
Filler				
Insulated copper conductor				

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Central strength member				

B.1.4 Cable construction

Table B.3 – Cable construction

Characteristics (9)	**IEC 60794-2:2017, clause/ subclause** (10)	**Family requirements** (11)	**Test methods** (12)	**Remarks** (13)
Lay-up	~~6.2~~5.9	According to the Detail Specification [a]	Visual inspection	
Cable core	~~6.3~~5.11	According to the Detail Specification		
Strength member – central – peripheral	~~6.4~~5.7	According to the Detail Specification	Visual inspection	
Outer cable sheath Material Minimum sheath thickness Outer diameter Optional protection	~~6.6~~5.11	 IEC 60794-2:~~2002~~ 2017, 6.6.3 According to the Detail Specification According to the Detail Specification According to the Detail Specification	 IEC 60811-202 IEC 60811-203	
Sheath marking Configuration, dimensions Abrasion resistance	~~6.7~~5.12	 According to the Detail Specification According to the Detail Specification	 Visual inspection IEC 60794-1-21, method E2B, method 1 Or IEC 60794-1-21, method E2B, method 2	
Sheath abrasion	~~8.10~~5.12	According to the Detail Specification	IEC 60794-1-21, method E2A	
Cable length				

[a] Detail specification.

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