

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Optical fibre cables –
Part 3-20: Outdoor cables – Family specification for self-supporting aerial
telecommunication cables**

**Câbles à fibres optiques –
Partie 3-20: Câbles extérieurs – Spécification de famille pour
les câbles optiques de télécommunication aériens autoporteurs**



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Family specification for self-supporting
aerial telecommunication cables****FOREWORD**

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International Standard IEC 60794-3-20 has been prepared by Subcommittee 86A: Fibres and cables, of IEC Technical Committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 2002. It constitutes a technical revision. The main changes are listed below:

- the fibres specification clause (Clause 5) has been enlarged to include fibre Types B5 and B6.a;
- an annex has been added for additional requirements according to the MICE table.

This bilingual version (2016-02) corresponds to the monolingual English version, published in 2009-01.

The text of this standard is based on the following documents:

FDIS	Report on voting
86A/1246/FDIS	86A/1253/RVD

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

The French version of this standard has not been voted upon.

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

A list of all parts of IEC 60794 series, published under the general title *Optic fibre cables*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
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[IEC 60794-3-20:2009](https://standards.iteh.ai/catalog/standards/sist/9-edbecde-0ceb-47bc-a1dd-eeb782fc86ca/iec-60794-3-20-2009)

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OPTICAL FIBRE CABLES –

Part 3-20: Outdoor cables – Family specification for self-supporting aerial telecommunication cables

1 Scope

This part of IEC 60794 which is a family specification covers optical self-supporting aerial telecommunication cables. Requirements of the sectional specification IEC 60794-3 for duct, buried and aerial cables are applicable to cables covered by this standard.

Self-supporting aerial telecommunication cable in this context means a cable construction with sufficient strength members designed to be suspended on poles and similar devices without the aid of another supporting wire or conductor. ADSS cables and other constructions intended for high-voltage applications are not covered by this standard.

Detail specifications may be prepared based on this family specification.

Clause A.2 contains requirements that supersede the normal requirements in case the cables are intended to be used in installation governed by the MICE table of ISO/IEC 24702.

The parameters specified in this standard may be affected by measurement uncertainty arising either from measurement errors or calibration errors due to lack of suitable standards. Acceptance criteria shall be interpreted with respect to this consideration (see IEC 60794-3, Clause 8).

The number of fibres tested shall be representative of the cable design and shall be agreed between the customer and the supplier.

2 Normative references

The following referenced documents are indispensable for the application 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 60654-4, *Operating conditions for industrial-process measurement and control equipment – Part 4: Corrosive and erosive influences*

IEC 60721-1, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*

IEC 60721-3-3, *Classification of environmental conditions – Part 3-3: Classification of groups of environmental parameters and their severities – Stationary use at weatherprotected locations*

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

IEC 60793-1-40, *Optical fibres – Part 1-40: Measurement methods and test procedures – Attenuation*

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

IEC 60793-1-48, *Optical fibres – Part 1-48: Measurement methods and test procedures – Polarization mode dispersion*

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

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

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

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

IEC 60811-1-1, *Common test methods for insulating and sheathing materials of electric cables and optical cables – Part 1-1: Methods for general application – Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*

IEC 60811-5-1, *Insulating and sheathing materials of electric and optic cables – Common test methods – Part 5-1: Methods specific to filling compounds – Drop-point – Separation of oil – Lower temperature brittleness – Total acid number – Absence of corrosive components – Permittivity at 23 °C – DC resistivity at 23 °C and 100 °C*

IEC 61000-2-5, *Electromagnetic compatibility (EMC) – Part 2: Environment – Section 5: Classification of electromagnetic environments. Basic EMC publication*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61326-1, *Electrical equipment for measurement, control and laboratory use – EMC requirements - Part 1: General requirements*

IEC 62363, *Radiation protection instrumentation – Portable photon contamination meters and monitors*

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

3 Symbols

For the purposes of this standard the following symbols apply

λ_{cc}	Cabled fibre cut-off wavelength.
d	Nominal outer diameter of the cable.
DS	Detail specification.
T_L	The acceptable amount of long term tensile load which is expected that the cable may experience during operation (i.e. after installation is completed). This load may be due to residual loading from the installation process and/or environmental effect.
T_M	The acceptable amount of short term tensile load which is expected that the cable experience during installation and/or handling.

T_{A1}	Temperature cycling test temperature limit according to IEC 60794-1-2, Method F1.
T_{A2}	Temperature cycling test temperature limit according to IEC 60794-1-2, Method F1.
T_{B1}	Temperature cycling test temperature limit according to IEC 60794-1-2, Method F1.
T_{B2}	Temperature cycling test temperature limit according to IEC 60794-1-2, Method F1.
t_1	Temperature cycling test dwell time.
$n \times d$	A value, n , times cable outer diameter, d , used for bends, mandrels, etc.

4 Optical fibre, cable construction and tests applicable for aerial telecommunication cables to be used in self-supporting aerial applications

4.1 Optical fibres

Attenuation values at 1 625 nm are optionally specified by the customer.

4.1.1 Common single-mode fibre requirements

Table 1 – Common single-mode fibre requirements

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Uncabled optical fibre	5.1	IEC 60793-2-50		
Attenuation discontinuities at 1 310 nm and 1 550 nm	5.2.2	$\leq 0,10$ dB	IEC 60793-1-40	
Cabled fibre cut-off wavelength	5.3	$\lambda_{cc} < \lambda_{\text{operational}}$	IEC 60793-1-44	
Fibre colouring	5.4	IEC 60304	Visual inspection	
Polarisation mode dispersion PMD_Q	5.5	IEC 60794-3	IEC 60793-1-48	
Outer diameter including colouring	8.2.1.1	IEC 60793-2-50	IEC 60793-1-20	

4.1.2 Single-mode dispersion unshifted (B1.1) optical fibre

Table 2 – Single-mode dispersion unshifted (B1.1) optical fibre

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Attenuation coefficient (cabled fibres)	5.2.1	According to DS	IEC 60793-1-40	
at 1 310 nm at 1 550 nm at 1 625* nm	5.2.1	$\leq 0,40$ dB/km $\leq 0,30$ dB/km $\leq 0,40$ dB/km		

* 1 625 nm performance is optional depending on agreement between customer and supplier.

4.1.3 Single-mode dispersion unshifted (B1.2) optical fibre

Table 3 – Single-mode dispersion unshifted (B1.2) optical fibre

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Attenuation coefficient (cabled fibres)	5.2.1	According to DS	IEC 60793-1-40	
at 1 550 nm at 1 625* nm	5.2.1	≤ 0,30 dB/km ≤ 0,40 dB/km		

4.1.4 Single-mode dispersion unshifted (B1.3) optical fibre

Table 4 – Single-mode dispersion unshifted (B1.3) optical fibre

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Attenuation coefficient (cabled fibres)	5.2.1	According to DS	IEC 60793-1-40	
at 1 310 at 1 383 ±3 nm at 1 550 at 1 625* nm	5.2.1	≤ 0,40 dB/km ≤ 0,40 dB/km ≤ 0,30 dB/km ≤ 0,40 dB/km		

4.1.5 Single-mode dispersion shifted (B2) optical fibre

Table 5 – Single-mode dispersion shifted (B2) optical fibre

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Attenuation coefficient (cabled fibres)	5.2.1	According to DS	IEC 60793-1-40	
at 1 550 nm	5.2.1	≤ 0,30 dB/km		

4.1.6 Single-mode non-zero dispersion (B4) optical fibre

Table 6 – Single-mode non-zero dispersion (B4) optical fibre

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Attenuation coefficient (cabled fibres)	5.2.1	According to DS	IEC 60793-1-40	
at 1 550 nm at 1 625* nm	5.2.1	≤ 0,30 dB/km ≤ 0,40 dB/km		

* 1 625 nm performance is optional depending on agreement between customer and supplier.

4.1.7 Single-mode non-zero dispersion shifted (B5) optical fibre

Table 7 – Single-mode non-zero dispersion shifted (B5) optical fibre

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Attenuation coefficient (cabled fibres)	5.2.1	According to DS	IEC 60793-1-40	
at 1 460 nm	5.2.1	≤ 0,40 dB/km		
at 1 550 nm and		≤ 0,30 dB/km		
at 1 625* nm		≤ 0,40 dB/km		

4.1.8 Single-mode (B6.a) optical fibre

Table 8 – Single-mode (B6.a) optical fibre

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Attenuation coefficient (cabled fibres)	5.2.1	According to DS	IEC 60793-1-40	
at 1 310 nm	5.2.1	NS		
at 1 310 nm -1625 nm		≤ 0,40 dB/km		
at 1 383 nm		≤ 0,40 dB/km		
at 1 550 nm		≤ 0,30 dB/km		
at 1 625* nm		NS		

4.2 Cable element

Table 9 – Cable element

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Cable element				
Compatibility	6	According to DS	Under consideration	
Slotted core	6.3	According to DS	Visual inspection	
Tube	6.4	According to DS	Visual inspection	
Compound flow and evaporation		According to DS	IEC 60794-1-2, Methods E14 and E15	
Outer diameter	8.2.1.1	According to DS	IEC 60811-1-1	
Ribbon	6.5	According to DS	Visual inspection	
Filler		According to DS		
Insulated copper conductor		According to DS		
Central strength member		According to DS		

* 1 625 nm performance is optional depending on agreement between customer and supplier.

4.3 Installation and operating conditions

4.3.1 Tests applicable

Table 10 – Tests applicable

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
General requirements	8.1	Agreement between customer and supplier		
Bend of cable element	8.2.1.2	According to DS	IEC 60794-1-2, Method G1	
Tube kinking	8.2.2.1	According to DS	IEC 60794-1-2, Method G7	
Ribbons :				
- dimensions	8.2.3.1	IEC 60794-3 Table 1	IEC 60794-3, 8.2.3.1	
- separability of individual fibres from ribbon	8.2.3.2.1	IEC 60794-3, 8.2.3.2.1 or according to DS	IEC 60794-1-2, Method G5 or according to DS	
- ribbon stripping	8.2.3.2.2	According to DS		
- torsion	8.2.3.2.3	According to DS	IEC 60794-1-2, Method G6	

4.3.2 Installation conditions

Under consideration.

4.4 Mechanical and environmental tests¹

4.4.1 Tests applicable

Table 11 – Mechanical and environmental applicable tests

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
Tensile performance	9.1	See 4.4.2.1 and according to DS	IEC 60794-1-2, Methods E1A and E1B	See 4.4.2.1
Installation capability (selection from the following)	9.2			
- bending under tension	9.2.1	According to DS	IEC 60794-1-2, Method E18	
- repeated bending	9.2.2	See 4.4.2.3	IEC 60794-1-2, Method E6	
- impact	9.2.3	See 4.4.2.4	IEC 60794-1-2, Method E4	

¹ Circular cables may be tested with the appropriate suspension equipment during tensile testing.

Characteristics (9)	IEC 60794-3 clause/subclause (10)	Family requirements (11)	Test methods (12)	Remarks (13)
- kink	9.2.4	According to DS	IEC 60794-1-2, Method E10	
- torsion	9.2.5	See 4.4.2.5	IEC 60794-1-2, Method E7	
Cable bend	9.3	According to DS	IEC 60794-1-2, Method E11	See 4.4.2.6
Crush	9.4	According to DS	IEC 60794-1-2, Method E3	See 4.4.2.7
Temperature cycling	9.5	According to DS	IEC 60794-1-2, Method F1	See 4.4.2.8
Ageing	9.6			
- coating adhesion stability	9.6.1	According to DS	IEC 60794-1-2, Method E5	
- finished cable	9.6.2	Under consideration		
Water penetration	9.7	According to DS	IEC 60794-1-2, Method F5B	
Pneumatic resistance (for unfilled pressurised cables)	9.8	According to DS	IEC 60794-1-2, Method F8	
Special installation conditions (selection from the following as suitable)				
- aeolian vibration	9.10.1	According to DS	IEC 60794-1-2, Method E19	
- shot gun resistance	9.10.2	According to DS	IEC 60794-1-2, Method E13	

4.4.2 Details on family requirements and test conditions for optical fibre cable tests

NOTE For some of the parameters specified in this standard, the objective is no change in attenuation.

These parameters may be affected by measurement uncertainty arising either from measurement errors or calibration errors due to a lack of suitable standards. Acceptance criteria shall be interpreted with respect to this consideration. The total uncertainty of measurement for this standard shall be $\leq 0,05$ dB for attenuation or $0,05$ dB/km for attenuation coefficient.

Any measured value within this range, either positive or negative, shall be considered as "no change in attenuation". The requirement for these parameters is indicated as "No change ($\leq 0,05$ dB or $\leq 0,05$ dB/km)".

By agreement between customer and supplier, minor deviation from this limit may be accepted at some low frequency, for example less than 10 %. However, for mechanical tests, no deviation excess of $0,15$ dB is accepted. For environmental tests, no deviation in excess of $0,10$ dB/km is accepted.

4.4.2.1 Tensile performance

This subclause identifies family requirements and test conditions that are referred to in Table 11.

a) Family requirements

Under long term tensile load (T_L) the fibre strain shall not exceed 20 % of the fibre proof strain and there shall be no change in attenuation during the test. Under short term tensile load (T_M) the fibre strain shall not exceed 60 % of the fibre proof strain and the attenuation change during test shall be measured and recorded. For aerial cables, the long term tensile load may