IEC 60794-3-20

Edition 3.0 2016-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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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 de télécommunication aériens autoporteurs

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OPTICAL FIBRE CABLES –

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

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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 third edition cancels and replaces the second edition published in 2009. It constitutes a technical revision.

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

a) the specification has been streamlined by cross-referencing IEC 60794-1-1, IEC 60794-1-2 and the IEC 60794-3 series;
b) an annex containing the MICE table has been deleted;
c) an annex on examples has been added.

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

FDIS	Report on voting
86A/1733/FDIS	86A/1760/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.

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

A list of all parts in the IEC 60794-3 series, published under the general title *Optical fibre cables – Part 3: Outdoor cables*, can be found on the IEC website.

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

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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 installed on power lines which require special sheath material for tracking and erosion resistance and other constructions intended for high-voltage applications are not covered by this standard.

Detail specifications may be prepared based on this family specification.

NOTE IEC TR 62839-1 gives rules to build an environmental declaration if needed.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Optical fibres – Part 2: Product specifications – General*

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

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

IEC 60794-1-22:2012, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental tests methods*

IEC 60794-3:2014, *Optical fibre cables – Part 3: Outdoor cables – Sectional specification*

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

IEC 60811-302, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 302: Electrical tests – Measurement of the d.c. resistivity at 23 °C and 100 °C of filling compounds*

3 Terms and definitions

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

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4 Symbols and abbreviations

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

5 General Requirements

5.1 Optical fibres

The optical fibre shall conform to the requirements of IEC 60793-2. The fibre type shall be agreed between the customer and supplier. The cabled fibre shall conform to IEC 60794-3.

5.2 Cable elements

The cable elements shall conform to IEC 60794-3.

5.3 Optical fibre cable construction

The cable construction shall conform to IEC 60794-3.

6 Details of family requirements and test conditions for optical fibre cable tests

6.1 General

Tests on single-mode cables are typically carried out at 1 550 nm. For 1 625 nm applications, performance criteria shall be mutually agreed upon between the customer and supplier. Multimode cables are typically tested at 1 300 nm.

6.2 Tensile performance

a) Family requirements

For 1 % proof-tested fibres, the fibre strain at MAT shall not exceed 20 % of this fibre proof strain (equal to absolute 0,2 % strain). The attenuation increase shall not exceed 0,15 dB, and there shall be no change in attenuation after the test. Other criteria may be agreed upon between the customer and the supplier.

For fibres proof tested at higher levels, the safe MAT will not scale linearly with proof strain, so a lower percentage of the proof strain is applicable. For greater than 1 % up to 2 % proof-tested fibres, MAT shall be limited to 17 % of the proof-test strain (equal to absolute 0,34 % strain for 2 % proof tested fibres).

Under visual examination without magnification, there shall be no damage to the sheath or to the cable elements.

Other criteria may be agreed upon between the customer and the supplier.

b) Test conditions

Method:	IEC 60794-1-21, Method E1 The cable shall be terminated with suitable dead end fittings adequate to the type of cable.
Tensile load on cable:	The specified MAT is applied and sustain this load level for 1 h.
Diameter of test pulleys:	1 m but not less than the minimum loaded bending diameter specified for the cable.

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

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6.3 Crush

a) Family requirements

Under long term load, there shall be no change in attenuation at 1 550 nm during the test, and under short term load, there shall be no change in attenuation at 1 550 nm after the test. The short term load shall be equal or larger than the long term load.

Under visual examination, there shall be no damage to the sheath or to the cable elements. The imprint of the plate or mandrel on the sheath is not considered mechanical damage.

b) Test conditions

For Figure B.2 construction cables, the test shall be carried out without the suspension strand.

Method:	IEC 60794-1-21, Method E3A	

The default method is the plate/plate test, Method E3A. Optionally, the mandrel/plate test, Method E3B, may be conducted if requested by the detail specification. Short and long term tests may be conducted separately.

Load (short term):	Un-armoured cable:	1,5 kN
	Armoured cable:	2,2 kN
Load (long term):	Un-armoured cable:	0,75 kN
	Armoured cable:	1,1 kN

6.4 Impact

a) Family requirements

Under visual examination without magnification, there shall be no damage to the sheath or to the cable elements. The imprint of the striking surface on the sheath is not considered mechanical damage.

There shall be no change in attenuation after the test.

b) Test conditions

For Figure B.2 constructions, the test shall be carried out without the suspension strand.

Method:	IEC 60794-1-21, Method E4	
Number of impacts:	One in 3 different places spaced not less than 500 mm apart	
Impact energy:	Un-armoured cable:	10 J
	Armoured cable:	30 J
Striking surface radius:	300 mm	

6.5 Repeated bending

a) Family requirements

Under visual examination without magnification, there shall be no damage to the sheath and to the cable elements.

b) Test conditions

For Figure B.2 construction cables, the suspension strand may be removed prior to testing.

Method:	IEC 60794-1-21, Method E6
Number of cycles:	25, or different number of cycles may be applied in accordance with particular user conditions.
Load:	Adequate to assure uniform contact with mandrel
Bending radius:	20 d

6.6 Torsion

a) Family requirements

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Under visual examination without magnification, there shall be no damage to the sheath or to the cable elements.

There shall be no change in attenuation after the test.

b) Test conditions

For Figure B.2 cables, the suspension strand may be removed prior to testing.

Method:	IEC 60794-1-21, Method E7
Number of cycles:	5
Number of turns:	One half turn (through 180°) over the length of 2 m in each direction
Length under test:	2 m

6.7 Bend

a) Family requirements

There shall be no change in attenuation after the test.

b) Test conditions

Method:	IEC 60794-1-21, Method E11

The default method is Method E11A. For large and/or stiff cables (e.g. where the mandrel diameter required is > 20 d), IEC 60794-1-21, Method E11B may be used.

Diameter of mandrel:	40 d
Number of turns / helix:	4
Number of cycles:	3
Test temperature:	Ambient (unless specifically requested otherwise)

For cable incorporating a non-metallic rod and/or metallic armouring, the diameter of the mandrel shall be limited to a value from 40 d to 80 d.

6.8 Bending under tension

a) Family requirements

MIT for the aerial cable designs shall be agreed between supplier and customer.

Under visual examination without magnification, there shall be no damage to the sheath and to the cable elements.

There shall be no change in attenuation after the test.

b) Test conditions

For Figure B.2 construction cable, the tests shall be carried out with the suspension strand included, and the direction of bend shall be that of the preferential bend direction of the cable.

Method:	IEC 60794-1-21, Method E18A
Tensile load on cable:	The specified MIT is applied for the test duration.
Diameter of mandrel:	40 d or the minimum loaded bending diameter specified for the cable
Bending angle:	45° ± 15°
Number of cycles:	20 moving cycles in each direction
Moving speed:	Between 1 m/s to 10 m/s
Length under test:	Minimum 9 m, minimum 2 m under bend tension
End preparation:	The cable should be terminated with the recommended dead end fitting.

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6.9 Temperature cycling

a) Family requirements

Attenuation measurements shall be taken during the last cycle.

In this document, acceptance criteria is interpreted with respect to this consideration (see IEC 60794-3:2014, Clause 8).

At T_{A1} and T_{B1} there shall be no change in attenuation as defined in IEC 60794-1-1.

At T_{A2} and T_{B2}, the change in attenuation coefficient shall be:

≤ 0,15 dB/km for single-mode fibre and shall be reversible to measurement uncertainty when measured in the 1 550 nm region.

≤ 0,3 dB/km for multimode fibre and shall be reversible to measurement uncertainty when measured in the 1 300 nm region.

On completion of the test, there shall be no change in attenuation.

b) Test conditions

Method:	IEC 60794-1-22, Method F1
Sample length under test:	Finished cable, length of at least 1 000 m
High temperature, T_{B2}:	+60 °C to +70 °C, depending on customer requirements
High temperature, T_{B1}:	+30 °C to +60 °C, depending on customer requirements
Low temperature, T_{A1}:	−10 °C to −20 °C, depending on customer requirements
Low temperature, T_{A2}	T_{A1} to –40 °C or −45 °C, depending on customer requirements
Number of cycles:	2, but additional cycles may be required in accordance with particular customer requirements.
For warmer or colder climates, t_1	temperature cycling test dwell time to stable temperature is reached.

Alternative high and low temperatures may be agreed between the customer and the supplier

6.10 Water penetration

a) Family requirements

The cable shall not propagate water longitudinally according to requirements of IEC 60794-1-22, Method F5B (jelly-filled cables) or Method F5C (dry water-blocked), unless otherwise agreed between the customer and the supplier.

b) Test conditions

Method: IEC 60794-1-22, Method F5B or F5C, as applicable

6.11 Aging

a) Family requirements

Method: IEC 60794-1-22:2012, Method F9, 11.5

b) Test conditions

Method: IEC 60794-1-22, Method F9

6.12 Installation conditions

See IEC TR 62691.

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