IEC 60794-6-30

Edition 1.0 2020-09

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Optical fibre cables –
Part 6-30: Indoor-outdoor cables – Family specification for weatherised indoor cables

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Câbles à fibres optiques –
Partie 6-30: Câbles intérieurs/extérieurs – Spécification de famille pour les câbles intérieurs résistants aux intempéries

IEC 60794-6-30:2020-09(en-fr)

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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OPTICAL FIBRE CABLES –

Part 6-30: Indoor-outdoor cables – Family specification for weatherised indoor cables

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International Standard IEC 60794-6-30 has been prepared by subcommittee SC86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

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

FDIS	Report on voting
86A/2038/FDIS	86A/2049/RVD

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 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

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OPTICAL FIBRE CABLES –

Part 6-30: Indoor-outdoor cables – Family specification for weatherised indoor cables

1 Scope

This part of IEC 60794 is a family specification covering optical fibre indoor cables that are deployed in short length (≤ 10 m) outdoor environments. These cables generally possess the characteristics associated with indoor cable designs having the appropriate fire performance and flexibility that makes them suitable for use in premises. Because of its predicted use outdoors, stability against environmental attack, for example UV radiation and humidity (see IEC 60794-6:2020, Table 1), is important. Typical application spaces include the extension of a short length of indoor cable outside the building such as to a NAP mounted outside the building at the house wall.

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.

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IEC 60332-1 (all parts), *Tests on electric and optical fibre cables under fire conditions – Part 1: Test for vertical flame propagation for a single insulated wire or cable*

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IEC 60332-3 (all parts), *Tests on electric and optical fibre cables under fire conditions – Part 3: Test for vertical flame spread of vertically-mounted bunched wires or cables*

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

IEC 60793-2-50:2018, *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 – General*

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

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

IEC 60794-1-24, *Optical fibre cables – Part 1-24: Generic specification – Basic optical cable test procedures – Electrical test methods*

IEC 60794-1-31:2018, *Optical fibre cables – Part 1-31: Sectional specification for cable element – optical fibre ribbon*

IEC 60794-1-215, *Optical fibre cables – Part 1-215: Generic specification – Basic optical cable test procedures – Environmental test methods – Cable external freezing test, Method F15*

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

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

IEC 60794-2-30:2019, *Optical fibre cables – Part 2-30: Indoor cables – Family specification for optical fibre ribbon cables for use in terminated cable assemblies*

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 60811-406, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 406: Miscellaneous tests – Resistance to stress cracking of polyethylene and polypropylene compounds*

ISO 4892-2:2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

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3 Terms, definitions and abbreviated terms

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

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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

3.1 Terms and definitions

No terms and definitions are listed in this document.

3.2 Abbreviated terms

NAP network access point

HFFR halogen free flame retardant

4 General specifications

4.1 Optical fibres

The optical fibre shall conform to the requirements of IEC 60793-2-10 or IEC 60793-2-50. The fibre type shall be agreed between the customer and supplier. The cabled fibre shall conform to IEC 60794-2.

4.2 Cable elements

The cable elements shall conform to IEC 60794-2.

5 Specifications for weatherised indoor cables – Construction

The cable design can be derived from a typical indoor cable design according to the product specifications described in IEC 60794-2. The specific demand related to UV resistance and resistance against humidity will require the appropriate selection of the jacket material in combination with other material and/or design considerations. See Annex A for examples of weatherised indoor cables.

6 Details of family specifications and test conditions for weatherised indoor cables

6.1 General

6.1.1 Referenced cable specifications

The specific specifications will depend on the specific design of the indoor cable which was selected as basis for the design of the weatherised indoor cable. The appropriate family specifications from IEC 60794-2 (all parts) should be referenced for mechanical (IEC 60794-2-10:2011, 5.3, IEC 60794-2-20:2013, 4.3, and IEC 60794-2-30:2019, 5.3) and environmental specifications (IEC 60794-2-10:2011, 5.4, IEC 60794-2-20:2013, 4.4, and IEC 60794-2-30:2019, 5.4). Additional design characteristics for outdoor exposure to UV radiation should reference IEC 60794-1-22, method F14. Test methods are defined in the generic specifications IEC 60794-1-21, IEC 60794-1-22, IEC 60794-1-23 and IEC 60794-1-24.

6.1.2 Test criteria

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6.1.3 Applicable tests

The cable types defined in these referenced IEC 60794-2 family specifications are simplex and duplex cables, multi-fibre cables, and ribbon cables. Family requirements and test conditions in 6.2 through 6.5 apply to these types, as noted. If no differentiation is stated in the subclause, they apply to all cable types.

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Compliance with the specification shall be verified by carrying out tests selected from Table 1. It is not intended that all tests in Table 1 be carried out in all cases. The tests to be applied and the frequency of testing shall be agreed between the customer and supplier.

Table 1 – Tests applicable for mechanical and environmental performance of weatherised indoor cables

Characteristics	Detail requirements	Test methods	Remarks
Mechanical tests			Typically required of most cable designs
Tensile performance	See 6.2.1	IEC 60794-1-21, method E1	
Abrasion	See 6.2.2	IEC 60794-1-21, method E2B	Resistance of sheath markings
Crush	See 6.2.3	IEC 60794-1-21, method E3A	Plate/plate crush test
Impact	See 6.2.4	IEC 60794-1-21, method E4	
Repeated bending	See 6.2.5	IEC 60794-1-21, method E6	
Torsion	See 6.2.6	IEC 60794-1-21, method E7	
Bend	See 6.2.7	IEC 60794-1-21, method E11	Default method E11A
Bending under tension	See 6.2.8	IEC 60794-1-21, method E18A, procedure 1	
Bending at low temperature	See 6.2.9	IEC 60794-1-21, method E11A	
Flexing	See 6.2.10	IEC 60794-1-21, method E8	
Kink	See 6.2.11	IEC 60794-1-21, method E10	Cable kink
Rip cord functional	See 6.2.12	IEC 60794-1-21, method E25	
Environmental tests			
Temperature cycling	See 6.3.1	IEC 60794-1-22, method F1	
Water penetration	See 6.3.2	IEC 60794-1-22, method F5	If specified
UV resistance	See 6.3.3	IEC 60794-1-22, method F14 (method ISO 4892-2)	
Environmental stress cracking	See 6.3.4	IEC 60811-406	Highly filled thermoplastics (e.g. FRNC materials) are sensitive to stress cracking. The test was developed for PE and PP and thus shall be adapted.
Compound flow (drip)	See 6.3.5	IEC 60794-1-22, method F16	If filled tubes are used
Bleeding and evaporation	See 6.3.6	IEC 60794-1-23, method G9	
Material compatibility	See 6.3.7	IEC 60794-1-219, method F19, should be applied	
Ageing	See 6.3.8	IEC 60794-1-22 method F9	

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Characteristics	Detail requirements	Test methods	Remarks
Cable freezing	-	IEC 60794-1-215, method F15A or F15B	Not included Not generally an issue for indoor cables. If required, see IEC 60794-6-10:2020, 6.3.6 for guidance.
Cable element tests			
Ribbon strippability	See 6.4.1	IEC 60794-1-23, method G10B	If ribbons are used
Ribbon tear (separability)	See 6.4.2	IEC 60794-1-23, method G5	If ribbons are used
Ribbon dimensions and geometry	See 6.4.3	IEC 60794-1-23, method G2	If ribbons are used
Ribbon torsion	See 6.4.4	IEC 60794-1-23, method G6	If ribbons are used
Ribbon residual twist	See 6.4.5	IEC 60794-1-23, method G8	If ribbons are used
Tube kinking	See 6.4.6	IEC 60794-1-23, method G7	If tubes are used.
Bend for optical cable elements	See 6.4.7	IEC 60794-1-23, method G1	
Stripping force stability of cabled optical fibres	See 6.4.8	IEC 60794-1-23, method G10A	
Other tests			
Fire performance	See 6.5.1	IEC 60332-1 (all parts) IEC 60332-3 (all parts) IEC 61034 IEC 60754-2	Regional legal requirements shall be fulfilled. For more details, see IEC TR 62222.
Electrical continuity	See 6.5.2	IEC 60794-1-24, method H3	For cables with metallic elements
Thickness of non-metallic sheath	See 6.5.3	IEC 60811-202	
Overall dimensions	See 6.5.4	IEC 60811-203	

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6.2 Mechanical tests

6.2.1 Tensile performance

a) Family specifications

While the cable is under short-term tensile load (T_M, rated tensile load),

- the axial fibre strain shall be < 60 % of the fibre proof strain, and
- the attenuation shall be measured and recorded. Any required max. change of attenuation shall be agreed between customer and supplier.

While the cable is under the long-term tensile load (T_L, residual load),

- the axial fibre strain shall be:
  - < 20 % of fibre proof test, for fibre proof tested to ≤ 1 % strain (e.g., 0,69 GPa, 0,2 % absolute strain), and

– < 17 % of fibre proof test, for fibre proof tested to greater than 1 % to 2 % strain (e.g., 0,69 GPa to 1,38 GPa, 0,34 % absolute strain for 2 % proof tested fibre);

NOTE For fibres proof tested at levels above 1 % strain, the safe long-term load will not scale linearly with proof strain, so a lower percentage of the proof stain is applicable. There is no agreement for strain limits for proof tests above 2 % strain.

- the change in attenuation shall be:
  - single-mode fibre: no change;
  - multimode fibre: ≤ 0,2 dB.

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

b) Test conditions (simplex and duplex cables)

Method: IEC 60794-1-21, method E1

Load: 75 N applied for 10 min for simplex cables and normal duplex cables 150 N for 10 min for duplex cables which consist of independent simplex cables

Diameter of chuck drums and transfer devices: Not less than 250 mm

Rate of transfer device: Either 100 mm/min or 100 N/min

Length of sample: Sufficient to achieve the desired accuracy of measurement of attenuation change and shall be agreed between customer and supplier.

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c) Test conditions (multi fibre cables)

Method: IEC 60794-1-21, method E1

Load and duration: 400 N or the weight of 1 km of cable, whichever is greater and for a minimum of 5 min

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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

Length of sample: Sufficient to achieve the desired accuracy of measurement of attenuation change (typically 300 m) and shall be agreed between customer and supplier.

d) Test conditions (fibre ribbon cables)

Method: IEC 60794-1-21, method E1

Load and duration: 400 N, applied for a minimum of 5 min

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

Length of sample: Sufficient to achieve the desired accuracy of measurement of attenuation change (typically 300 m) and shall be agreed between customer and supplier.

6.2.2 Abrasion

a) Family specifications

Sheath abrasion resistance: There shall be no perforation of the sheath after performing the needle test according to method E2A of IEC 60794-1-21.

Cable marking abrasion: The print shall be legible after the test performed according to method E2B of IEC 60794-1-21 (felt test).

b) Test conditions (sheath abrasion resistance)

Method: IEC 60794-1-21, method E2A

Load: 2 N

Number of cycles: 50

NOTE Other loads and number of cycles can be agreed between customer and supplier.

c) Test conditions (cable marking resistance)

Method: IEC 60794-1-21, method E2B, method 2

Load: 4 N

Number of cycles: 3

NOTE Other loads and number of cycles can be agreed between customer and supplier.

6.2.3 Crush

a) Family specifications

Under the short term load (installation test), the attenuation change shall not exceed

- 0,15 dB for single-mode fibres;
- 0,30 dB for multimode fibres.

At the end of the long term loading (operational test), before releasing the load, there shall be no change in attenuation from the initial value(s) (for multi fibre cables).

There shall be no visible damage to the cable elements.

b) Test conditions (simplex and duplex cables)

Method: IEC 60794-1-21, method E3A

Load: 500 N

Duration: 1 min

Length between test locations: 500 mm

NOTE In the case of flat cables, the force is applied on the flat sides of the cable.

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c) Test conditions (multi fibre cables)

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Method: IEC 60794-1-21, 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

d) Test conditions (fibre ribbon cables)

Method: IEC 60794-1-21, method E3A

Force: 500 N

Duration: 1 min

Length between test locations: 500 mm

6.2.4 Impact

a) Family specifications

No fibre break

b) Test conditions (simplex and duplex cables, multi fibre cables, fibre ribbon cables)

Method: IEC 60794-1-21, method E4

Impact energy: 1,0 J

Radius of striking surface: 12,5 mm

Number of impacts: at least 3

Length between test locations: 500 mm

6.2.5 Repeated bending

a) Family specifications

Simplex and duplex cables, multifibre cables, ribbon cables: There shall be no damage to the sheath and to the cable elements as well as no fibre breakage

b) Test conditions (simplex cables and duplex cables)

Method:	IEC 60794-1-21, method E6
Bending radius:	20 times cable diameter
Number of cycles:	100
Mass of weight:	2 kg

c) Test conditions (multi fibre cables)

Method: IEC 60794-1-21, method E6

Bending radius: 20 times cable diameter

Number of cycles: 100

Mass of weight: 4 kg

d) Test conditions (fibre ribbon cables)

Method: IEC 60794-1-21, method E6

Bending radius: 100 mm

Number of cycles: 100

Mass of weight: 4 kg

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6.2.6 Torsion

a) Family specifications

IEC 60794-6-30:2020
https://standards.iteh.ai/catalog/standards/sist/6b00ed8e-dec0-4507-929a-6a49c199b9d1/iec-60794-6-30-2020

There shall be no damage to the sheath and to the cable elements as well as no fibre breakage.

b) Test conditions (simplex and duplex cables)

Method:	IEC 60794-1-21, method E7
Number of cycles:	3
Distance between fixed and rotation clamp:	125 times cable diameter but no more than 1 m.
Tension load:	20 N

c) Test conditions (Multi fibre cables)

Method:	IEC 60794-1-21, method E7
Number of cycles:	10
Distance between fixed and rotation clamp:	125 times cable diameter. However max. 2,0 m
Tension load:	20 N

d) Test conditions (Fibre ribbon cables)

Method:	IEC 60794-1-21, method E7
Number of cycles:	20
Distance between fixed and rotation clamp:	250 mm
Tension load:	20 N

6.2.7 Bend

a) Family specifications

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