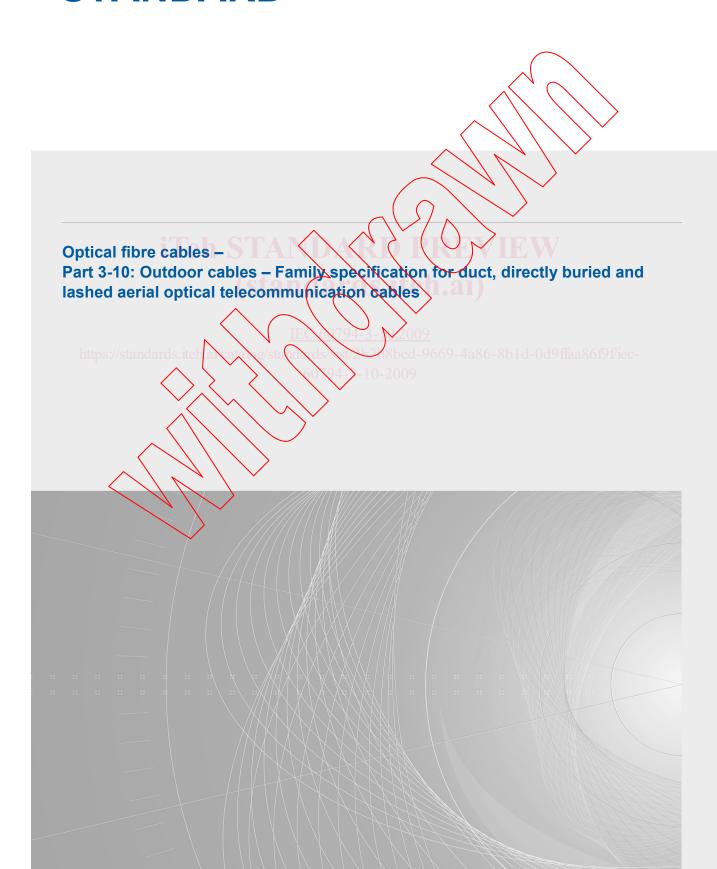


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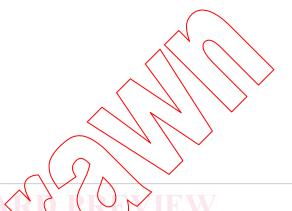
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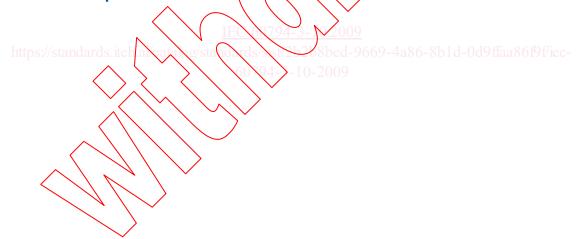
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INTERNATIONAL STANDARD



Optical fibre cables -

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



INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES -

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

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International Standard IEC 60794-3-10 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 title of the specification has been updated to include lashed applications;
- the fibres specification clause (Clause 4) has been enlarged to include fibre Types B5 and B6.a;
- an annex has been added for additional requirements according to the MICE table.

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

| FDIS | Report on voting |
|---------------|------------------|
| 86A/1245/FDIS | 86A/1252/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 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 publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.jec.ch" in the data related to the specific publication. At this date, the publication will be

- · reconfirmed.
- · withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.



OPTICAL FIBRE CABLES -

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

1 Scope

This part of IEC 60794 which is a family specification covers optical telecommunication cables to be used in ducts or direct buried applications. The cable may also be used for lashed aerial applications. Requirements of the sectional specification IEC 60794-3 for duct, buried and aerial cables are applicable to cables covered by this standard.

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.

Annex B gives information on the lashed aerial application.

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.

https://standards.iteh.a/cata.vo/sta

528bed-9669-4a86-8b1d-0d9ttaa86t9t/iec-

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 – Cutoff 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 procedures

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.

- $\lambda_{\rm cc}$ Cabled fibre cut-off wavelength.
- d Nominal outer diameter of the cable.
- DS Detail specification.
- 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.
- $T_{\rm A1}$ Temperature cycling test temperature limit according to IEC 60794-1-2, Method F1.
- $T_{\rm A2}$ Temperature cycling test temperature limit according to IEC 60794-1-2, Method F1.
- $T_{\rm B1}$ Temperature cycling test temperature limit according to IEC 60794-1-2, Method F1.

- $T_{\rm B2}$ 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 optical telecommunication cables to be used in ducts, direct buried or lashed aerial applications

4.1 Optical fibres



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 | ≤ 0,10 dB | IEC 60793-1-40 |
| Cabled fibre cut-off wavelength | 5.3 | $\lambda_{cc} < \lambda$ operational | IEC 60793-1-44 |
| Fibre colouring | 5.4 | IEC 60304 | Visual inspection |
| Polarisation mode dispersion $PMD_{\mathbf{Q}}$ | 5.5 | IEC 60794-3 | IEC 60793-1-48 |
| Outer diameter including colouring | 8.2.1.1 | IEC 60793-2-50 | NEC 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 mm at 1 625* nm | 5.2.1 | ≤ 0,40 dB/km ≤ 0,30 dB/km ≤ 0,40 dB/km | 9-4a86-8b1d-0d9 | ffaa86f9f/iec- |

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 | | |

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

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 | 5.2.1 | ≤ 0,40 dB/km | | |
| at 1 383 ± 3 nm | | ≤ 0,40 dB/km | | |
| at 1 550 | | ≤ 0,30 dB/km | | |
| at 1 625* nm | | ≤ 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 | .ai) | |

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

Table 6 - Single-mode non-zero dispersion (B4) optical fibre 18619 Fice-

| 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 | | |

4.1.7 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 | | |

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

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 at 1 310 nm -1625 nm at 1 383 nm at 1 550 nm at 1 625* nm | 5.2.1 | NS ≤ 0,40 dB/km ≤ 0,40 dB/km ≤ 0,30 dB/km 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 | | | | T 7 |
| Compatibility 11011 | SIA61 | According to DS | Under consideration | V |
| Slotted core | 6.3 | According to DS | Visual inspection | |
| Tube | 6.4 | According to DS | Visual inspection | |
| Compound flow and evaporation | <i>\)</i> | According to DS | IEC 60794-1-2, (1) Methods E14 and E15 | 19ffaa86f9f/iec- |
| 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 | | |

4.3 Installation and operating conditions

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, | IEC 60794-3, | |