SLOVENSKI STANDARD
oSIST prEN IEC 60794-3-11:2025

01-maj-2025

Optični kabli - 3-11. del: Kabli za zunanjo uporabo - Podrobna specifikacija za kanalske, neposredno vkopane in (z vezicami) povezane nadzemne optične telekomunikacijske kable

Optical fibre cables - Part 3-11: Outdoor cables - Detailed specification for duct, directly buried, and lashed aerial optical fibre telecommunication cables

Câbles à fibres optiques - Partie 3-11: Câbles extérieurs - Spécification particulière pour les câbles de télécommunication à fibres optiques, destinés à être installés dans des conduites, directement enterrés et en aériens ligaturés

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IEC SC 86A : FIBRES AND CABLES	
SECRETARIAT: France	SECRETARY: Mr Laurent Gasca
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED:	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING **Attention IEC-CENELEC parallel voting** The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Optical fibre cables - Part 3-11: Outdoor cables – Detailed specification for duct, directly buried, and lashed aerial optical fibre telecommunication cables

PROPOSED STABILITY DATE: 2030

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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OPTICAL FIBRE CABLES –

Part 3-11: Outdoor cables – Detailed specification for duct, directly buried, and lashed aerial optical fibre telecommunication cables

FOREWORD

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IEC 60794-3-11 has been prepared by subcommittee 86A: OPTICAL FIBRES AND CABLES, of IEC technical committee 86: FIBRE OPTICS. It is an International Standard.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

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

a) the title of the specification has been updated to include lashed applications;

b) the fibres specification clause (6.2.2) has been enlarged to include fibre types B-657.B2/B3';

c) this specification has been updated to include multimode optical fibres.

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

Draft	Report on voting
86A/XX/FDIS	86A/XX/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.

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

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

OPTICAL FIBRE CABLES –

Part 3-11: Outdoor cables – Detailed specification for duct, directly buried, and lashed aerial optical fibre telecommunication cables

1 Scope

This part of IEC 60794 sets forth detailed requirements and characteristics specific to this type of optical fibre cables for duct, direct buried, and lashed installation.

This specification includes functional mechanical, environmental and optical requirements, recommended features and test methods for assessing the product against the stated requirements.

The specified test methods, where applicable, are those referenced in IEC 60794-1-1 and described in detail in IEC 60794-1-21, IEC 60794-1-22, IEC 60794-1-23..

The requirements of this specification supplement those of the sectional specification IEC 60794-3 and the family specification IEC 60794-3-10

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.

IEC 60708, *Low-frequency cables with polyolefin insulation and moisture barrier polyolefin sheath*

IEC 60793-1-22, *Optical fibres – Part 1-22: Measurement methods and test procedures – Length measurement*

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 60793-2-10, *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, *Optical fibre cables – Part 1-1: Generic specification – General*

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

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

IEC 60794-1-22, *Optical fibre cables - Part 1-21: Generic specification - Basic optical cable test procedures – Environmental test methods*

IEC 60794-1-23, *Optical fibre cables - Part 1-21: Generic specification - Basic optical cable test procedures – Cable element test methods*

IEC 60794-3 (all parts), *Optical fibre cables – Part 3: Sectional specification – Outdoor cables*

IEC 60794-3-10, *Optical fibre cables – Part 3-10: Outdoor cables – Family specification for duct, directly buried and lashed aerial optical telecommunication cables*

IEC 60811-1-20, *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 60811-202, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 202: General tests - Measurement of thickness of non-metallic sheath*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TR 61931 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 Symbols

The following symbols are used in this document:

λ_{cc} cable cut-off wavelength

d outer cable diameter

SZ technique in which the lay reverses direction periodically.

5 General requirements

5.1 Overview

Optical fibres are widely used for telecommunication purposes and are cabled to satisfy the functional requirements of the installation environment. Further, cables placed into ducts and sub-ducts may be installed using solely, or a combination of, pushing, pulling, air-assisted, or other non-listed installation techniques.

For duct installation, the environment and infrastructure can be varied and may also involve the use of single and multiple sub-ducts.

Directly buried cables may be installed by a variety of methods such as ploughing and trenching with different environments and infrastructure. This may require specific cable design solutions based on multiple layers of armours and sheaths. It is recognised that certain designs of cable for direct buried applications involving such solutions may also be suitable for duct installation.

For aerial installation on poles, lashed aerial in metropolitan networks it is important to minimise in-service cable movement. Movement of the cable produced by thermal changes, cable weight, ice loading, wind, etc. may have a detrimental effect on the aerial cable.

5.2 General cable description

5.2.1 Characteristics of optical fibre

Single-mode optical fibres are classified according to their operational wavelength and dispersion characteristics. The fibres covered by this specification are categorised as type B and are described in IEC 60793-2-50. Single-mode fibre types featured in this specification are listed below:

- dispersion unshifted (B-652.B/D);
- bending loss insensitive (B-657.B2/B3/A1/A2);
- dispersion shifted (B-653.A/B);
- cut-off shifted (B-654.A/B/C/D/E), non-zero dispersion (B-655.C/D/E) ;
- wide-band non-zero dispersion-shifted (B-656).

Multimode optical fibres are classified according to their operational wavelength and modal bandwidth. Multimode fibres as covered by this specification are Category A1as specified in IEC 60793-2-10. multimode fibre types featured in this specification are listed below:

- A1-OM2
- A1-OM3
- A1-OM4
- A1-OM5

5.2.2 Characteristics of optical fibre cable elements

Optical fibre cable elements such as buffer tubes, tensile strength elements, crush protection elements, water blocking elements, sheath removal elements and cable sheath shall be suitably designed to provide adequate means of fibre location, identification, modularity, protection during cable manufacture, installation, and termination.

The structure of these elements, and the materials used in their manufacture, shall not have any long-term detrimental effects on fibre performance during the service life of the cable, splice enclosure and/or cabinet.

To satisfy these functional requirements, the different elements shall comply with the requirements of IEC 60794-3 series as well as those outlined in Clause 7 of this standard.

5.2.3 Characteristics of optical fibre cables

Optical fibre cables, for the intent of this standard, are completed cable products as shipped by the manufacturer typically on disposable reels. Such products do not require additional assembly, or the use of additional materials or protection to meet the requirements contained herein. Some assembly or added protection is usually required only where the cables are terminated to other cables or equipment, and typically involve the use of an optical fibre closure or other hardware to protect fibre splices or connectorization points and other cable elements like loose tubes, fibres, ribbons, etc.

The required levels of protection for the fibre can be achieved by laying up or assembling the cable elements in association with suitable strength and/or anti-buckling members. These can be either metallic or non-metallic and positioned at the centre of the cable core or as peripheral

members in or underneath the outer cable sheath. The cable may also contain moisture barrier tapes, metallic or non-metallic tapes, and water blocking or swellable materials.

5.2.4 Environmental and product safety requirements

IEC Guide 104 should be taken into account as far as possible. The materials of the cables in contact with the environment shall not be hazardous to the environment and personnel.

It should be noted that the cables specified by this standard are rarely accessible once installed. Therefore, the risk of exposure to hazardous materials, if any, is mostly a concern in the handling of the cable during manufacturing and installation. Additionally, the type of outer sheath specified herein is generally considered to be non-toxic, therefore the risk to the environment or personnel is minimal once properly installed.

This standard does not address the use of all types of cable materials that may be utilized in various cable designs to support meeting the requirements unique to a specific type of special application (e.g., very high temperatures or resistance to specific chemical attack). In such cases, it is incumbent on the customer and supplier to agree on the requirements applicable to such materials and cable designs, and to determine any special handling precautions or instructions needed as a result of their use.

5.3 Optical fibre splice-ability

All of the single-mode fibre types covered in this specification can readily achieve very low splice loss levels using a range of commercially available splicing techniques.

Typical bi-directional splice losses at 1 550 nm should be below 0,1 dB, with an average of 0,05 dB for fusion splices between fibres of the same category performed by skilled operators on active alignment splicers according to the current best practices. Additional fibre compatibility guidelines are provided in IEC/TR 62000.

All of the multimode fibre types covered in this specification can readily achieve very low splice loss levels using a range of commercially available splicing techniques.

Typical bi-directional splice losses at 850 nm should be below 0,1 dB, with an average of 0,05 dB for fusion splices between fibres of the same category performed by skilled operators

NOTE 1 Higher maximum splice losses can be tolerated without affecting the link transmission capability.

NOTE 2 Splices of fibres of the same category, but different manufacturers and/or different production processes, do generally not exceed the above values.

NOTE 3 If fibres of different categories are spliced, typically the splice loss is slightly higher than with splices between fibres of the same category.

5.4 Testing

5.4.1 General

For all test procedures, the atmospheric test conditions shall be as specified in IEC 60794-1-2. All measured and computed values are to be rounded to the number of decimal places given in the corresponding acceptance criteria for each requirement. The minimum number of tested fibres in a cable should be as recommended in IEC 60794-1-1.

5.4.2 No change in attenuation

5.4.2.1 General

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