SLOVENSKI STANDARD
SIST EN 60794-3:1997

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Optical fibre cables - Part 3: Telecommunication cables - Sectional specification (IEC 794-3:1994)

Optical fibre cables -- Part 3: Telecommunication cables - Sectional specification

Lichtwellenleiter-Kabel -- Teil 3: Fernmeldekabel - Rahmenspezifikation

Câbles à fibres optiques -- Partie 3: Câbles de télécommunication - Spécification intermédiaire

Ta slovenski standard je istoveten z: EN 60794-3:1994

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33.180.10 (Optiļ na) vlakna in kabli Fibres and cables

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EUROPEAN STANDARD

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EN 60794-3
(Equivalent to
EN 187100)

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English version

Optical fibre cables
Part 3: Telecommunication cables
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Câbles à fibres optiques
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This European Standard was approved by CENELEC on 1994-07-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Contents

Foreword

This standard has been produced in accordance with a specialised agreeement on work repartition and cooperation for standardisation concerning fibre optics and is part of the CEN/CENELEC/ETSI (European Telecommunications Standards Institute) cooperation agreement.

It uses information provided by the ETSI on functional and system related aspects by means of two Interim European Telecommunications Standards (I-ETS).

These two documents, I-ETS 300 226: Single-mode optical fibre cables to be used in duct and for directly buried application, and I-ETS 300 229: Single-mode optical fibre cables to be used for aerial application prepared by ETSI/TM1/WG1 have been reviewed and completed by the CECC.

According to the CEN/CENELEC/ETSI cooperation agreement, this standard suspersedes these two documents, automatically withdrawn at the date of publication of this standard, complemented by family specifications on duct and buried cables and aerial cables.

The text of the draft was submitted to the IEC-CENELEC parallel vote procedure and was approved by CENELEC as EN 60794-3 on 1994-07-05.

This European Standard is equivalent to EN 187100. All references in other European Standards to EN 187100 should be understood as references to this EN 60794-3.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	1995-08-01
- latest date by which national standards conflicting with the EN have to be withdrawn	(dow)	1995-08-01

1 - Scope

This standard specifies the requirements of single-mode optical fibre cables which are intended to be used primarily in public telecommunications networks. Other types of applications requiring similar types of cables can be considered.

In particular, requirements for cables to be used in ducts or for directly buried application and aerial cables are included in this standard.

Underwater cables for lakes and river crossings and cables for indoor applications will be incorporated in this standard at a later stage.

For aerial application, this standard does not cover all functional aspects of cables installed in the vicinity of overhead power lines. In the case of such application additional requirements and test methods may be necessary.Moreover, this standard excludes optical ground wires and cables attached to the phase or earth conductors of overhead power lines.

Submarine cables are also excluded.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 187000	1992	Generic specification: Optical fibre cables NOTE: EN 187000 largely corresponds to, but is not identical with IEC 794-1.
EN 188000	1993	Generic specification: Optical fibres NOTE: EN 188000 largely corresponds to, but is not identical with IEC 793-1.
EN 188100 (in preparation)	-	Sectional specification: Single-mode (SM) optical fibre
EN 188101 (in preparation)	-	Family specification: Single-mode dispersion unshifted (B1.1) optical fibre
EN 188102 (in preparation)	-	Family specification: Single-mode dispersion shifted (B2) optical fibre
HD 402 S2	1984	Standard colours for insulation for low-frequency cables and wires (IEC 304:1982)
HD 505.4.2 S1	1992	Common test methods for insulating and sheathing materials of electric cables - Part 4: Methods specific to polyethylene and polypropylene compounds - Section 2 (IEC 811-4-2:1990)
HD 505.5.1 S1	1992	Common test methods for insulating and sheathing materials of electric cables - Part 5: Methods specific to filling compounds - Section 1 (IEC 811-5-1:1990)
IEC 189	series	Low-frequency cables and wires with p.v.c. instulation and p.v.c. sheath
IEC 708-1 A3	1981 1988	Low-frequency cables with polyolefin insulation and moisture barrier sheath - Part 1: General design details and requirements
CCITT/ITU-T Recommendation K.25	1988	Lightning protection of optical fibre cables

3 Symbols

For the purposes of this standard the following symbols apply.

λ_{cc} Cabled fibre cut-off wavelength

SZ A technique in which the lay reverses direction periodically

4 Optical fibre

4.1 General

Single-mode optical fibre shall be used which meets the requirements of EN 188100, EN 188101 or EN 188102.

4.2 Attenuation

4.2.1 Attenuation coefficient

The typical maximum attenuation coefficient of a cable at 1310 nm is 0,45 dB/km and/or at 1550 nm it is 0,30 dB/km. Particular values shall be agreed between the user and the manufacturer.

The attenuation coefficient shall be measured in accordance with EN 188 000, method 301, 302 or 303.

4.2.2 Attenuation uniformity

4.2.2.1 Attenuation discontinuities

The local attenuation shall not have point discontinuities in excess of 0,10 dB.

The test method best suited to provide the functional requirements is under consideration.

4.2.2.2 Attenuation linearity

The functional requirements are under consideration.

4.3 Cut-off wavelength

The cabled fibre cut-off wavelength λ_{cc} shall be less than the operational wavelength.

4.4 Fibre colouring

If the primary coated fibres are coloured for identification the coloured coating shall be readily identifiable throughout the lifetime of the cable and shall be a reasonable match to HD 402. If required, the colouring shall permit sufficient light to be transmitted through the primary coating to allow local light injection and detection. Alternatively, the colour may be removed for this application.

A test for the resistance of the colour to cleaning agents is under consideration.

5 Cable element

Generally optical cables comprise several elements or individual constituents, depending on the cable design which takes into account the cable application,operating environment and manufacturing processes, and the need to protect the fibre during handling and cabling.

The material(s) used for a cable element shall be selected to be compatible with the other elements in contact with it. An appropriate compatibility test method shall be defined in the family or detail specification.

Optical elements (cable elements containing optical fibres) and each fibre within a cable element shall be uniquely identified, for example by colours, by a positional scheme, by markings or as specified in the detail specification.

Different types of optical elements are described below:

5.1 Tight secondary coating or buffer

If a tight secondary coating is required it shall consist of one or more layers of polymeric material. The coating shall be easlily removable for splicing. The nominal overall diameter of the secondary coating shall be between 800 µm and 900 µm. The value, which shall be agreed between the user and the manufacturer, shall have a tolerance of ± 50 µm. The fibre/secondary coating eccentricity shall not exceed 75 µm unless otherwise agreed between the user and the manufacturer.

The colour of the tight secondary coating shall be readily identifiable throughout the lifetime of the cable.

5.2 Ruggedised fibre

Further protection can be provided to tight secondary coated fibres by surrounding one or more with non-metallic strength members within a sheath of suitable material (e.g. for fan-out cables).

5.3 Slotted core

The slotted core is obtained by extruding a suitable material (for example polyethylene or polypropylene) with a defined number of slots, with helical or SZ configuration along the core. One or more primary coated fibres or optical element is located in each slot which may be filled.

The slotted core usually contains a central element which may be either metallic or non-metallic. In this case, there shall be adequate adhesion between the central element and the extruded core in order to obtain the required temperature stability and tensile behaviour for the slotted core element.

The profile of the slot shall be uniform and shall ensure the optical and mechanical performance required of the optical cable.

5.4 Loose tube

One or more primary coated fibres are packaged in a loose tube construction which may be filled. The loose tube may be reinforced with a composite wall.

One aspect of the suitability of the tube shall be determined by an evaluation of its kink resistance in accordance with EN 187 000, method 512.

The bleeding performance of the filling compound from the tube shall comply with EN 187 000, method 608.

5.5 Ribbon

Optical fibre ribbons are optical fibres assembled in a composite linear array.

Fibres shall be arranged to be parallel and formed into ribbons of typically two, four, six, eight, ten or twelve fibres each according to user requirements. The fibres within the ribbons shall remain parallel and not cross over.

The design intent is that adjacent fibres within a ribbon are contiguous and that fibre centerlines are straight, parallel and coplanar.

Unless otherwise specified, each ribbon shall be uniquely identified with a printed legend or by uniquely colouring the reference fibre in the ribbon and/or by colouring the matrix material of the ribbon.

Ribbon structures are typically designated as either edge-bonded or encapsulated, depending on the amount of buffering afforded the fibres by the bonding agent. Figure 1 illustrates the edge-bonded structure in which the bonding agent is applied predominantely between the fibres. Figure 2 illustrates the encapsulated structure in which the bonding agent extends well beyond the extreme surface of any fibre. Both ribbon structures are capable of meeting the requirements of this specification.

NOTE -- Some parameters shall be measured in the ribbon since the corresponding test on the primary coated fibre or finished cable are not sufficient for complete characterization. These parameters are identified in the following text.

6 Optical fibre cable construction

6.1 General

The cable shall be designed and manufactured for a predicted operating lifetime of at least 20 years. In this context, the attenuation of the installed cable at the operation wavelength(s) shall not exceed values agreed between the user and the manufacturer. The materials in the cable shall ensure that the increase in attenuation shall not exceed the specified value. This specification value may include, for example, the effect of hydrogen.

All the fibres in the cables shall be of the same type and origin.

There shall be no fibre splice in a delivery length unless otherwise agreed by the user and the manufacturer.

It shall be possible to identify each individual fibre throughout the length of the cable.

For the particular case of cables for aerial application, to avoid excess fibre strain induced by the environmental conditions, such as wind loading or ice loading, the cable construction and particularly the strength members shall be selected to limit this strain to safe levels.

6.2 Lay -up of the cable elements

Optical elements as described in clause 5 may be laid up as follows:

a) single optical element(s) without a stranding lay (for a single tube its kink resistance shall be evaluated only if required) ;

b) a number of homogeneous optical elements using helical or SZ configurations (ribbon elements may be laid up by stacking two or more elements) ;