SLOVENSKI STANDARD

SIST EN 187200:2004

september 2004

Področne specifikacije: Optični kabli za uporabo ob električnih močnostnih napeljavah (daljnovodih) (OCEPL)

Sectional specification: Optical cables to be used along electrical power lines (OCEPL)

ICS 33.180.10

Referenčna številka
SIST EN 187200:2004(en)

EUROPEAN STANDARD **EN 187200**

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ICS 33.180.10

English version

Sectional Specification: Optical cables to be used along electrical power lines (OCEPL)

Spécification intermédiaire:
Câbles optiques équipant les lignes électriques aériennes (COLEA)

Rahmenspezifikation:
Lichtwellenleiterkabel auf Starkstrom-Freileitungen (OCEPL)

This European Standard was approved by CENELEC on 1999-10-01. 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.

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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

Ref. No. EN 187200:2001 E

Foreword

This European Standard was prepared by a joint working group of the Technical Committees CENELEC TC 7, Overhead electrical conductors, and TC 86A, Optical fibres and optical fibre cables.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 187200 on 1999-10-01.

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)	2001-11-01
latest date by which national standards conflicting with the EN have to be withdrawn	(dow)	2002-10-01

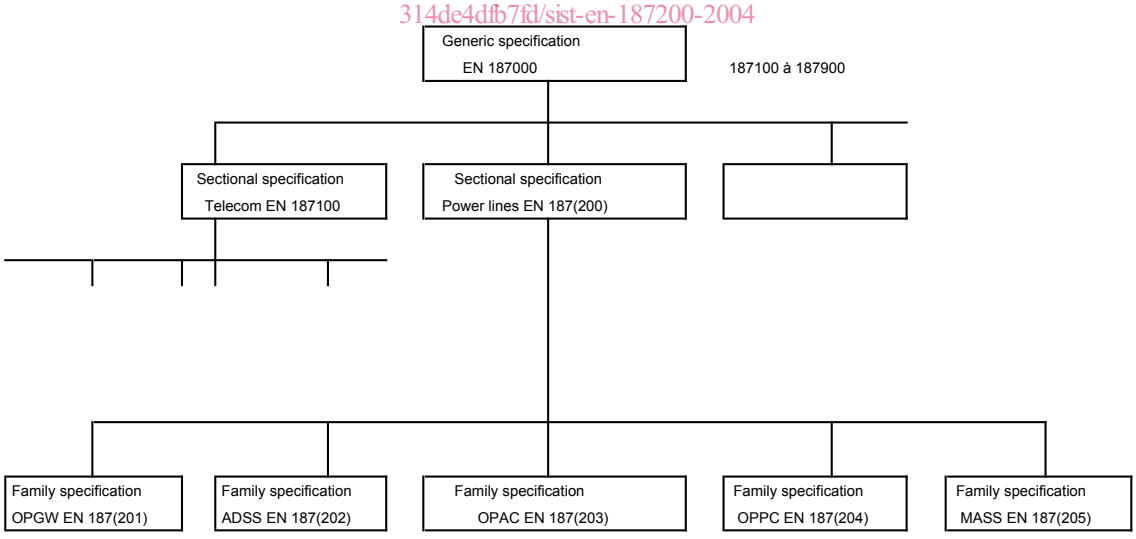
Annexes designated 'normative' are part of the body of the standard. Annexes designate 'informative' are given for information only. In this standard, Annexes B to G are normative and Annex A is informative.

This Sectional Specificaton is based, whenever possible, on European Standards (EN) or on publications of the International Electrotechnical Commission (IEC).

The chart hereafter presents the general architecture of the EN standardization of optical aerial cables to be used along electrical power lines.

A family specification can only be used when associated with the relevant sectional specification.

STANDARDIZATION OF OPTICAL AERIAL CABLES TO BE USED ALONG ELECTRICAL POWER LINES



It was agreed that this standard will include all test methods or references needed for OCEPL.

At the moment, the tests methods for OPGW are included in the Sectional Specification and will be transferred to the Generic Specification EN 187000.

In case of special environment, additional requirements and tests may be taken into account, such as corrosion, bending, etc....

Contents

1 Scope

This standard specifies the requirements of single-mode and graded index optical fibre cables for OCEPL.

2 Normative references

This 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 standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 50182	Conductors for overhead lines - Round wire concentric lay stranded conductors
EN 50183	Conductors for overhead lines - Aluminium-magnesium-silicon alloy wires
EN 50189	Conductors for overhead lines - Zinc coated steel wires
EN 50326[1)]	Characteristics of grease for bare overhead line conductors
EN 60794-1-2	Optical fibre cables -- Part 1-2 : Generic specification - Basic optical cable test procedures
EN 60794-3	Optical fibre cables -- Part 3: Telecommunication cables - Sectional specification
EN 60889	Hard-drawn aluminium wire for overhead line conductors
EN 61232	Aluminium-clad steel wire for electrical purposes (IEC 61232:1995, modified)
EN 61395	Overhead electrical conductors - Creep test procedure for stranded conductors
EN 187000	Generic specification : Optical fibre cables.
EN 188000	Generic specification : Optical fibres
EN 188100	Sectional specification : Single-mode (SM) optical fibre
EN 188101	Family specification : Single-mode dispersion unshifted (B1.1) optical fibre
EN 188102	Family specification : Single-mode dispersion shifted (B2) optical fibre
EN 188200	Sectional specification : Optical fibre A1 category graded index multimode fibres
EN 188201	Family specification : A1a graded index multimode optical fibres
EN 188202	Family specification : A1b graded index multimode optical fibres
IEC 60304	Standard colours for insulation for low-frequency cables and wires (harmonized as HD 402 S2:1984)
IEC 60708-1	Low-frequency cables with polyolefin insulation and moisture barrier polyolefin sheath -- Part 1 : General design details and requirements
IEC 61312-1	Protection against lightning electromagnetic impulse -- Part 1 : General principles

1) In preparation.

3 Abbreviations and definitions

ADSS	All Dielectric Self Supporting cable
CSA	Cross Sectional Area
EDS	Every Day Stress : Installed cable tension at a given ambient temperature without wind or ice loading effects
MAOCC	Maximum Allowable Ovality of a Cable or its Component : the maximum ovality a cable or a component of the cable can withstand without any change in its function, for the whole life of the product
MASS	Metallic Aerial Self Supported cable which is not designed to have ground or phase capability
MAT	Maximum Allowable Tension : the maximum tension under expected worst case loading conditions or any specified value.
MWT	Maximum Working Tension : the maximum tensile load that may be applied to the cable without detriment to the tensile performance requirement (optical performance, fibre strain)
OCEPL	Optical Cable to be used along Electrical Power Lines.
OPAC	OPtical Attached Cable
OPGW	OPtical Ground Wire. An OPGW has the dual performance functions of a conventional ground wire with telecommunication capabilities.
OPPC	OPtical Phase Conductor. An OPPC has the dual performance functions of a phase conductor with telecommunication capabilities.
RTS	Rated Tensile Strength : summation of the product of nominal cross-sectional area, minimum tensile strength and stranding factor for each load bearing material in the cable construction (refer to annex A in case of OPGW)
strain margin	The strain margin is defined as the amount of strain the OCEPL can sustain without strain on the fibres due to OCEPL's elongation.

4 Optical fibre

4.1 General

Single-mode optical fibre shall be used which meets the requirements of EN 188100 in conjunction with EN 188101 or EN 188102. Graded index multimode optical fibre shall be used which meets the requirements of EN 188200 in conjunction with EN 188201 and EN 188202.

4.2 Attenuation

4.2.1 Attenuation coefficient

The typical maximum attenuation coefficient of a single mode optical fibre cable at 1 310 nm is 0,45 dB/km and/or at 1 550 nm it is 0,30 dB/km. The typical attenuation coefficient of a category A1a (A1b) multimode optical fibre cable at 850 nm is 2,6 dB/km to 2,9 dB/km (3,0 dB/km to 3,7 dB/km) and/or at 1 300 nm it is 0,7 dB/km to 1,1 dB/km (0,8 dB/km to 1,6 dB/km). Particular values shall be agreed between the purchaser and the manufacturer.

The attenuation coefficient shall be measured in accordance with EN 188000, 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 attenuation linearity measurement is under consideration (may be EN 188000, method 303).

4.3 Cut-off wavelength of cabled fibre

For single mode optical fibre cables, the cabled fibre cut-off wavelength λ_{cc} shall be less than the operational wavelength.

4.4 Fibre identification

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 IEC 60304. 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 removable.

5 Optical units

Generally optical cables comprise several elements or individual constituents, depending on the cable design, which take 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 detailed specification.

Different types of optical elements are described below.

5.1 Slotted core

The slotted core is either a metallic (for example aluminium alloy) or non-metallic material (for example polyethylene or polypropylene) with a defined number of slots, with longitudinal, 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 with a suitable water blocking compound.

If metallic, it must be electrically bonded with the other metallic elements of the cable. If non metallic, the slotted core usually contains a central element which shall be 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 for the optical cable.

5.2 Plastic tube

One or more primary coated fibres are packaged, loosely or not, in a tube construction which may be filled with a suitable water blocking compound. The plastic 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 187000, method 512, if applicable.

5.3 Ribbon

Optical fibre ribbons are optical fibres assembled in accordance with EN 60794-3, item 5.5.

5.4 Metallic tube

5.4.1 Metallic tube on the optical core

A metallic tube (for example aluminium tube) may be applied on the optical core (slotted core, plastic tubes).

5.4.2 Fibres directly located in a metallic tube

One or more primary coated and coloured fibres are packaged in a metallic hermetically sealed tube which may be filled with a suitable compound to avoid water penetration.

The surface of the tube should be smooth without any defects.

For corrosion protective purposes the metallic tube may be covered by an additional layer which allows electrical connection.

6 Optical fibre cable construction

6.1 General

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

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

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

To avoid excess fibre strain induced by the environmental conditions, such as wind or ice loading, the cable construction and particularly the strength members shall be selected to avoid any longitudinal strain on fibres up to the specified MAT.

The optical fibre unit shall house the optical fibres and protect them from damage due to environmental, mechanical forces such as longitudinal compression, crushing, bending, twisting, tensile stress, long and short term heat effects.

The aerial cable types can be divided into the groups :

- Optical ground wire or optical phase conductor (OPGW or OPPC),
- All dielectric self supporting cable (ADSS),
- Optical attached cables (OPAC),
- Metallic Aerial Self Supported cables (MASS).

These aerial cables have different constructions, environmental and electrical operating conditions for the use on high voltage lines.

6.2 Lay-up of the cable elements

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

a) single optical unit in the cable centre ;

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

c) a number of hybrid configurations in slotted core such as ribbon or plastic tube .

If required, insulated copper conductors in single, pair or quad construction may be laid up with the optical elements.

6.3 Cable core filling

If specified, the element(s), and in addition the cable core, shall include water blocking compound, or water swelling element.

The bleeding performance of the filling compound from the tube shall comply with EN 187000, method 608.

6.4 Strength members

The kind and materials of strength elements shall fulfil the mechanical and thermal requirements of the overhead lines. The materials may be metallic or non-metallic.