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Optical fibre cables –
Part 4-10: Family specification – Optical ground wires (OPGW) along electrical
power lines

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

**Part 4-10: Family specification –
Optical ground wires (OPGW) along electrical power lines**

FOREWORD

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International Standard IEC 60794-4-10 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 2006 and constitutes a technical revision.

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

- a) galloping test (9.7) has been added to the type tests list;
- b) update of definitions clause; maximum installation tension (MIT) defined and used in the sheave test description;
- c) definition of characterization of OPGW's mechanical behaviour in order to provide information useful for electrical power transmission lines designers;

- d) improved definition of lightning test parameters and conditions to improve reproducibility among different laboratories.

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

CDV	Report on voting
86A/1594/CDV	86A/1627/RVC

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 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 publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.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- withdrawn,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.

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OPTICAL FIBRE CABLES –

Part 4-10: Family specification – Optical ground wires (OPGW) along electrical power lines

1 Scope

This part of IEC 60794-4, which is a family specification, covers cable construction, test methods and optical, mechanical, environmental and electrical performance requirements for OPGW (optical ground wire) which is used for the protection of electrical power lines against atmospheric discharges or short-circuits and, at the same time, as a high bandwidth transport media for communications-and-control optical signals. The corresponding environmental declaration may be built according to IEC TR 62839-1.

The OPGW is a substitute for a conventional ground-/shield-wire containing optical fibres for control and/or telecommunication purposes. Usually the fibres are embedded loosely in protective buffer tubes. To fulfil mechanical and electrical requirements; an armouring of one or more layers with aluminium, aluminium alloy, and aluminium clad steel, galvanized steel or a mixture of them is helically stranded. If the construction contains an aluminium tube or an aluminium slotted core, this cross section is considered as a conductive part.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

<https://standards.iteh.ai/>
<https://standards.iteh.ai/IEC/60794-4-10/2014>

[https://standards.iteh.ai/IEC/60104, Aluminium-magnesium-silicon alloy wire for overhead line conductors -60794-4-10-2014](https://standards.iteh.ai/IEC/60104/Aluminium-magnesium-silicon%20alloy%20wire%20for%20overhead%20line%20conductors/60794-4-10-2014)

IEC 60304, *Standard colours for insulation for low-frequency cables and wires*

IEC 60793 (all parts), *Optical fibres*

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 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specifications 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*¹

IEC 60794-1-22:2012, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental test methods*

IEC 60794-1-24:2014, *Optical fibre cables – Part 1-24: Generic specification – Basic optical cable test procedures – Electrical test methods*

IEC 60794-4:2003, *Optical fibre cables – Part 4: Sectional specification – Aerial optical cables along electrical power lines*

IEC 60888, *Zin-coated steel wires for stranded conductors*

IEC 60889, *Hard-drawn aluminium wire for overhead line conductors*

IEC 61089:1991, *Round wire concentric lay overhead electrical stranded conductors*

IEC 61232, *Aluminium-clad steel wires for electrical purposes*

IEC 61394, *Overhead lines – Characteristics of greases for aluminium, aluminium alloy and steel bare conductors*

IEC 61395, *Overhead electrical conductors – Creep test procedures for stranded conductors*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Cables

[IEC 60794-4-10:2014](https://standards.iteh.ai/catalog/standards/iec/0c582e20-1e17-4c09-b2cc-f0b639ed8698/iec-60794-4-10-2014)

3.1.1

optical ground wire

OPGW

metallic optical cable that has the dual performance functions of a conventional ground wire with telecommunication capabilities

3.2 Other definitions

3.2.1

rated tensile strength

RTS

summation of the product of nominal cross-sectional area, nominal tensile strength and stranding factor (minimum 0,9) for each load bearing material in the cable construction

Note 1 to entry: See Annex A of IEC 60794-4:2003 for details of the recommended method to calculate rated tensile strength of OPGW.

3.2.2

creep test

test designed to determine the long-term tensile creep characteristics of metallic aerial installed cables

¹ To be published.

Note 1 to entry: The information derived from this test is used in the sag-tension calculations during the design layout of the OPGW in the electrical system.

3.2.3

fittings

hardware used for stringing and clipping of OPGW to the structures at the end of the installation procedure

Note 1 to entry: Suspension, dead end, vibration damper and bonding clamps hardware are designed for a specific size and/or type of OPGW cable.

3.2.4

optical fibre unit

cable element designed to house and to protect the optical fibres from damage due to mechanical, thermal and electrical influences and moisture penetration

Note 1 to entry: Further details are given in Clause 6.

3.2.5

maximum allowable ovality

MAOC

unit or its component that does not exceed the specified value when calculated as $(d_1 - d_2)/(d_1 + d_2)$ in %

where

d_1 is the maximum measured diameter of the cable or the component;

d_2 is the minimum diameter of the cable or the component at the same cross-section as d_1 .

3.2.6

maximum allowable tension

MAT

maximum tensile load that may be applied to the cable without detriment to the tensile performance requirement

Note 1 to entry: Such performances requirements may be optical, fibre strain and mechanical.

3.2.7

maximum installation tension

MIT

maximum recommended stringing tension during installation

3.2.8

strain margin

commonly referred to as 30 % of proof test level and the basis for defining the MIT and MAT of the optical cable

Note 1 to entry: The strain margin (%) is directly related to the amount of mechanical tension, in N, a specific cable design can sustain without strain on the optical fibres due to cable elongation.

4 Optical fibre

4.1 General

Single-mode optical fibres shall be used which meet the requirements of the relevant part of IEC 60793. Fibres other than those specified above can be used, if mutually agreed between the customer and supplier.