

This is a preview - click here to buy the full publication



IEC 60794-4-10

Edition 2.0 2014-10

# INTERNATIONAL STANDARD



---

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE

R

---

ICS 33.180.10

ISBN 978-2-8322-1909-6

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions .....	7
3.1 Cables .....	7
3.2 Other definitions .....	7
4 Optical fibre.....	8
4.1 General.....	8
4.2 Attenuation .....	9
4.2.1 Attenuation coefficient .....	9
4.2.2 Attenuation uniformity and attenuation discontinuities.....	9
4.3 Cut-off wavelength of cabled fibre.....	9
4.4 Fibre colouring.....	9
4.5 Polarization mode dispersion (PMD) .....	9
5 Cable element .....	9
6 Cable construction.....	10
7 Cable design characteristics .....	10
8 Cable tests .....	11
8.1 General.....	11
8.2 Classification of tests .....	11
8.2.1 Type tests.....	11
8.2.2 Factory acceptance tests .....	12
8.2.3 Routine tests .....	12
8.3 Type tests .....	12
8.3.1 General .....	12
8.3.2 Tensile performance .....	12
8.3.3 Stress-strain test .....	13
8.3.4 Breaking strength test.....	13
8.3.5 Sheave test .....	13
8.3.6 Aeolian vibration test .....	14
8.3.7 Creep .....	14
8.3.8 Low frequency vibration test (Galloping test) .....	15
8.3.9 Temperature cycling .....	15
8.3.10 Water penetration (applicable to optical unit(s) only).....	16
8.3.11 Short-circuit.....	16
8.3.12 Lightning test.....	16
8.4 Factory acceptance tests .....	17
8.4.1 General .....	17
8.4.2 Typical tests .....	17
8.5 Routine tests.....	17
8.5.1 General .....	17
8.5.2 Typical tests .....	18
9 Quality assurance.....	18
Annex A (informative) Packaging and marking .....	19
Bibliography.....	20

Table 1 – Cable design characteristics.....	10
Table 2 – Lightning test conditions and parameters to be informed in the test report.....	17

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### OPTICAL FIBRE CABLES –

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

#### FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## 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.

IEC 60104, *Aluminium-magnesium-silicon alloy wire for overhead line conductors*

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*<sup>1</sup>

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 overherad 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*

---

<sup>1</sup> To be published.