

REDLINE VERSION



**Optical fibre cables –
Part 4-20: Sectional specification – Aerial optical cables along electrical power
lines – Family specification for ADSS (all dielectric self-supported) optical cables**

Preview

VOORBEELD

Dit document mag slechts op een stand-alone PC worden geïnstalleerd. Gebruik op een netwerk is alleen.
gebruik op een netwerk is alleen toegestaan als een aanvullende licentieovereenkomst voor netwerkgebruik met NEN is afgesloten.
This document may only be used on a stand-alone PC. Use in a network is only permitted when
a supplementary license agreement for us in a network with NEN has been concluded.



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2018 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

REDLINE VERSION



Optical fibre cables –
Part 4-20: Sectional specification – Aerial optical cables along electrical power
lines – Family specification for ADSS (all dielectric self-supported) optical cables

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.10

ISBN 978-2-8322-6009-8

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

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviated terms	8
4 Optical fibres	10
General.....	
Attenuation.....	
Attenuation coefficient.....	
Attenuation discontinuities.....	
Cut off wavelength of cabled fibre.....	
Fibre colouring.....	
Polarisation mode dispersion (PMD).....	
5 Cable elements	11
6 Optical fibre cable constructions	11
6.1 General.....	11
Optical unit.....	
6.2 Cable protection elements.....	11
7 Main requirements for installation and operating conditions	12
8 Cable design considerations	12
9 Cable tests.....	13
9.1 General.....	13
Classification of tests.....	
Type tests.....	
Factory acceptance tests.....	
Routine tests.....	
9.2 Tensile performance.....	14
9.2.1 General	14
9.2.2 Family requirement	15
9.2.3 Test conditions	15
9.3 Sheave test.....	15
9.3.1 General	15
9.3.2 Family requirement	16
9.3.3 Test conditions	16
Installation capability.....	
9.4 Repeated bending.....	16
9.4.1 General	16
9.4.2 Family requirements.....	16
9.4.3 Test conditions	16
9.5 Impact	17
9.5.1 General	17
9.5.2 Family requirements.....	17
9.5.3 Test conditions	17
9.6 Crush.....	17
9.6.1 General	17
9.6.2 Test requirements.....	17

9.6.3	Test conditions	17
<hr/>		
Kink		
9.7	Torsion	18
9.7.1	General	18
9.7.2	Test requirements	18
<hr/>		
Vibration testing		
9.8	Aeolian vibration test.....	18
9.8.1	General	18
9.8.2	Family requirements.....	18
9.8.3	Test conditions	18
9.8.4	Parameters to be reported.....	18
9.9	Low frequency vibration test (galloping test)	19
9.9.1	General	19
9.9.2	Family requirements.....	19
9.9.3	Test conditions	19
9.10	Temperature cycling	20
9.10.1	General	20
9.10.2	Family requirements.....	20
9.10.3	Test conditions	20
9.11	Water penetration	20
9.12	Weathering resistance Cable UV resistance.....	21
9.13	Tracking and erosion resistance test.....	21
9.14	Creep behaviour	21
9.15	Fitting compatibility	22
<hr/>		
Factory acceptance tests		
<hr/>		
Routine tests		
10	Quality assurance.....	23
Annex A (informative)	Packaging and marking.....	24
Annex B (informative)	Installation considerations for ADSS cables.....	25
Annex C (informative)	Electrical test (tracking).....	27
C.1	General.....	27
C.2	Option C1 C2 – Sheath material qualification	27
C.2.1	Overview	27
C.2.2	Test arrangements	27
C.2.3	Test procedure.....	28
C.2.4	Requirements	28
<hr/>		
Option C2 – Example of test for Sahara desert conditions		
C.3	Option C3 – Pollution level and tracking resistance	31
C.3.1	Overview	31
C.3.2	Test setup.....	31
C.3.3	Test method.....	33
C.3.4	Overview of pollution model and electrical test.....	34
Annex D (informative)	All dielectric self-supported (ADSS) cables to be used in overhead power lines (blank detail specification)	36
Bibliography	38

~~Figure – Draft of test equipment~~

~~Figure – Test chamber~~

Figure B.1 – Example of different span lengths allowed for the same cable, depending on sag variation	26
Figure C.1 – Electric scheme for the test	31
Figure C.2 – Foils of the electrodes	32
Figure C.3 – Nozzle	32
Figure C.4 – Details for the spraying	33
Figure C.5 – Pollution model Distributed element model with dry band arc gap	34
Figure C.6 – Basic circuit for arcing test Thevenin equivalent circuit	35
Table 1 – Cable design characteristics	13
Table 2 – Optional parameters (if required by customer)	13
Table C.1 – R_{eq} and C_{eq} values for different pollution index values	33
Table D.1 – Blank detail specification	36

Copyright
Preview

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

Part 4-20: Sectional specification – Aerial optical cables along electrical power lines – Family specification for ADSS (all dielectric self-supported) optical cables

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.

DISCLAIMER

This Redline version is not an official Standard and is intended to provide the user with an indication of what changes have been made to the previous version. Only the IEC International Standard provided in this package is to be considered the official Standard.

This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60794-4-20 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 2012 and constitutes a technical revision.

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

- a) this document has been streamlined by cross-referencing IEC 60794-1-1, IEC 60794-4 (all parts) and IEC 60794-1-2;
- b) reference to the MICE table has been deleted;
- c) the example of test method for particular environment in Annex C has been deleted;

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

FDIS	Report on voting
86A/1867/FDIS	86A/1876/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://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.

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 4-20: Sectional specification – Aerial optical cables along electrical power lines – Family specification for ADSS (all dielectric self-supported) optical cables

1 Scope

This part of IEC 60794-4, which is a family specification, covers optical telecommunication cables, commonly with single-mode fibres¹ ~~to be~~ used primarily in overhead power lines applications. The cables ~~may~~ can also be used in other overhead utility networks, such as for telephony or TV services. Requirements of the sectional specification IEC 60794-4 for aerial optical cables along electrical power lines are applicable to cables covered by this document.

This document covers the construction, mechanical, electrical, and optical performance, installation guidelines, acceptance criteria, test requirements, environmental considerations, and accessories compatibility for an all dielectric, self-supporting fibre optic (ADSS) cable. This document provides construction and performance requirements that ensure, within the guidelines of this document, that the ~~required mechanical capabilities~~ integrity of the cable components ~~and maintenance of optical fibre integrity and optical transmissions are proper~~ as well as optical fibre mechanical reliability and transmission parameters are maintained.

The ADSS cable consists of single mode optical fibres contained in one or more protective dielectric fibre optic units surrounded by or attached to suitable dielectric strength members and sheaths. The cable ~~does not~~ contains metallic components. An ADSS cable is designed to meet the optical and mechanical requirements under different ~~types of~~ installation, operating and environmental conditions and loadings, as described in Annex B.

This document excludes any "fished" or "wrapped" OPAC cables included in IEC 60794-4. Figure 8 aerial cables are also excluded; they are specified in IEC 60794-3-20.

~~Cables intended for installation in conformity with ISO/IEC 24762 and related standards may require the specification of additional tests to ensure their suitability in the applicable environments defined by the mechanical, ingress, climatic and chemical, and electromagnetic (MICE) classification. These tests are outside of the scope of IEC 60794 cable specifications, and MICE criteria are not part of the requirements for IEC 60794 specifications. The MICE tests may be the same as, similar to, or substantially different from, the tests required by IEC 60794 specifications. Cables manufactured per IEC 60794 specifications may or may not meet the MICE criteria. For supplemental discussion, see IEC/TR 62362.~~

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

~~IEC 60793-1-40, Optical fibres — Part 1-40: Measurement methods and test procedures — Attenuation~~

¹ In some particular situations in the electrical industry, short overhead links can be also designed with multimode fibres.

~~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, Optical fibres – Part 2: Product specifications – General

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: Generic specification – General

~~IEC 60794-1-2, Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures^{2,3}~~

IEC 60794-1-21:2015, Optical fibre cables – Part 1-21: Generic specification – Basic optical cable test procedures – Mechanical test methods

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

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

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

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

ISO 9001, Quality management systems – Requirements

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms, definitions and abbreviated terms given in IEC 60794-1-1 and IEC 60794-4, ~~as well as the following~~, apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

~~maximum allowable tension~~

~~MAT~~

~~maximum tensile load that may be applied to the cable without detriment to the performance requirements (optical performance, fibre durability) due to fibre strain~~

² ~~This document has been withdrawn, but can still be purchased, if necessary. Until IEC 60794-1-21 will be available, the tests stated in Clause 9 have to be taken from IEC 60794-1-2.~~

³ ~~This standard will be replaced by IEC 60794-1-21, Optical fibre cables – Part 1-21: Generic specification – Basic optical cable test procedures – Mechanical test methods (see also Bibliography), as soon as it will be available.~~

~~Note 1 to entry: Due to installation codes the MAT value is sometimes restricted to be less than 60 % of the breaking tension of the cable.~~

3.2 **maximum operation tension** **MOT**

~~tensile load that can be applied to the cable either permanently or for a long term without producing any strain to the fibres~~

~~Note 1 to entry: This condition should correspond to the tension with no ice and no gale wind at average mean temperatures throughout the year, assumed to be between 16 °C and 20 °C.~~

3.3 **zero strain margin**

~~tensile load that the cable can sustain without strain on fibres due to cable elongation~~

3.4 **breaking tension**

~~tensile load that will produce physical rupture of the cable~~

~~Note 1 to entry: There is no optical consideration related to this parameter.~~

~~Note 2 to entry: The breaking tension should be calculated. The design model shall be validated; the cables do not need to be tested.~~

3.5 **maximum installation tension** **MIT**

~~maximum load that should be applied during the installation procedure~~

~~Note 1 to entry: The maximum installation tension refers mainly to the final adjust of sag (also called sagging load), and the same tension limit can be used for the deployment of the cable (also called stringing load).~~

~~Note 2 to entry: This is a recommended value aimed at avoiding tension values higher than MAT during operational life due to wind, ice or temperature changes.~~

3.6 **ADSS**

~~all dielectric self supported cable~~

~~dielectric cable that is capable of enduring aerial installation and providing long term service, without any external tensile support~~

3.7 **OPAC**

~~optical attached cable~~

~~dielectric, not self supported, optical attached cable~~

~~Note 1 to entry: OPACs can be used with one of the following attachment methods:~~

- ~~• wrapped, known as an all dielectric (wrap): using special machinery, a lightweight flexible non metallic cable is wrapped helically around either the earth wire or the phase conductor;~~
- ~~• lashed: non metallic cables are installed longitudinally alongside the earth wire, the phase conductor or on a separate support cable (on a pole route) and are held in position with a binder or adhesive cord;~~
- ~~• spiral attached: similar to the lashed cables except that the method of attachment involves the use of special preformed spiral attachment clips.~~

~~Note 2 to entry: OPAC cable designs are not covered by this specification.~~

3.8
3.8 cable fittings and dampers

3.8.1
3.8.1 suspension cable fitting

device to hold up the cable in intermediate support points along an aerial line, where the cable is under tension at both sides of the fitting

3.8.2
3.8.2 dead end cable fitting

device designed to terminate an installation run, isolate a splice location or maintenance coil, provide slack span locations, or provide for extreme angle turns, where the cable is under tensional load on one side of the fitting and tension free on the other

3.8.2
3.8.2 damper

device attached to a cable in order to suppress or minimize vibrations due to wind

4
4 Optical fibres

4.1
4.1 General

Single mode optical fibres shall be used that meet the requirements of IEC 60793-2-50. ~~In this clause only the main characteristics are mentioned.~~ Other types of fibre can be agreed upon between the customer and the supplier; such fibre shall conform to IEC 60793-2. The cabled fibre shall conform to IEC 60794-4.

~~Fibres other than those specified above can be used, if mutually agreed between the customer and supplier. In this case, fibre characteristics and attenuation criteria for mechanical tests shall be specified in the detail specification.~~

4.2
4.2 Attenuation

4.2.1
4.2.1 Attenuation coefficient

~~The requirements for the uncabled fibres shall be according to IEC 60793-2-50.~~

~~Unless other values are agreed between supplier and customer, the maximum attenuation coefficient of the cabled fibres shall be 0,35 dB/km when measured at 1 310 nm and/or 0,25 dB/km at 1 550 nm.~~

~~Different values from those stated above can be agreed between customer and supplier.~~

~~The attenuation coefficient shall be measured in accordance with IEC 60793-1-40.~~

4.2.2
4.2.2 Attenuation discontinuities

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

~~The test method used to verify the functional requirements shall be in accordance with IEC 60793-1-40.~~

4.3
4.3 Cut-off wavelength of cabled fibre

~~The cabled fibre cut-off wavelength λ_{cc} shall be lower than the operational wavelength when measured in accordance with IEC 60793-1-44.~~

ALTIJD DE ACTUELE NORM IN UW BEZIT HEBBEN?

Nooit meer zoeken in de systemen en uzelf de vraag stellen:
“Is IEC 60794-4-20:2018-RL en de laatste versie?”™

Via het digitale platform NEN Connect heeft u altijd toegang tot de meest actuele versie van deze norm. Vervallen versies blijven ook beschikbaar. **U en uw collega's** kunnen de norm via NEN Connect makkelijk raadplagen, online en offline.

Kies voor slimmer werken en bekijk onze mogelijkheden op www.nenconnect.nl.

Heeft u vragen?

Onze Klantenservice is bereikbaar maandag tot en met vrijdag, van 8.30 tot 17.00 uur.

Telefoon: 015 2 690 391

E-mail: klantenservice@nen.nl

