

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

COMMENTED VERSION

Optokablar – Del 1-1: Artspecifikation – Allmänt

*Optical fibre cables –
Part 1-1: Generic specification –
General*

En så kallad ”Commented Version” (CMV) innehåller både den fastställda IEC-standard och en kommenterad och ändringsmarkerad standard. Alla tillägg och borttagningar sedan den tidigare utgåvan är markerade med färg. Med en CMV sparar du mycket tid när du ska identifiera och förklara aktuella ändringar i standarden. SEK Svensk Elstandard kan bara ge ut CMV i de fall den finns tillgänglig från IEC.



IEC 60794-1-1

Edition 5.0 2023-05
COMMENTED VERSION

INTERNATIONAL STANDARD



**Optical fibre cables –
Part 1-1: Generic specification – General**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.10

ISBN 978-2-8322-7058-5

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
4 Graphical symbols and abbreviated terms	13
5 Optical fibre cables – IEC 60794 structure	14
5.1 General	14
5.2 IEC 60794-1 series	15
5.3 IEC 60794-2 series	15
5.4 IEC 60794-3 series	16
5.5 IEC 60794-4 series	16
5.6 IEC 60794-5 series	17
5.7 IEC 60794-6 series	17
5.8 IEC 60794-7 series	17
6 Cable materials	17
6.1 Indoor cable materials	17
6.2 Outdoor cable materials	18
6.3 Indoor/outdoor cable materials	18
6.2 Electrical conductors	18
6.3 Other materials	18
6.4 Environmental requirements for cable materials	19
7 Cable construction	19
7.1 General	19
7.2 Colour coding	19
7.2.1 Overview	19
7.2.2 Fibre-colouring colour coding	19
7.2.3 Unit colour coding	19
7.2.4 Sheath colour coding	20
7.3 Optical Fibre	20
7.3.1 General	20
7.3.2 Attenuation coefficient	20
7.3.3 Attenuation uniformity – Attenuation discontinuities	20
7.3.4 Cable cut-off wavelength	20
7.3.5 Polarization mode dispersion (PMD)	20
7.4 Buffer tubes	20
7.5 Tensile strength elements	21
7.6 Crush protection elements	21
7.7 Water blocking elements	21
7.8 Sheath removal elements	21
7.9 Cable sheath	21
8 Measuring and test methods	21
8.1 General	21
8.2 Measuring methods for transmission and optical characteristics	22
8.3 Measuring methods for dimensions	22
8.4 Measuring Test methods for mechanical characteristics	23

8.5	Measuring Test methods for environmental characteristics.....	23
8.6	Measuring Test methods for cable element characterization.....	23
8.7	Measuring and test methods for electrical characteristics.....	23
9	Related Technical Reports	
Annex A (informative) Guidelines for specific defined applications optical fibre and cabled fibre performance.....		
A.1	General.....	25
A.2	Cabled fibre attenuation requirements.....	25
A.3	Cabled fibre bandwidth requirements	27
A.4	Type testing at 1 625 nm.....	28
Annex B (informative) Guidelines for qualification sampling		
B.1	General.....	30
B.2	Fibre selection for cable testing.....	30
B.3	Pass/fail criteria.....	31
Annex C (informative) Preferred temperatures.....		
Bibliography.....		
List of comments.....		
Table 1 – IEC 60794 structure		
Table 2 – IEC 60794-1 series		
Table 3 – IEC 60794-2 series		
Table 4 – IEC 60794-3 series		
Table 5 – IEC 60794-4 series		
Table 6 – IEC 60794-5 series		
Table 7 – IEC 60794-6 series		
Table 8 – Indoor cables materials (examples)		
Table 9 – Outdoor cable materials (examples)		
Table 10 – Measuring methods for transmission and optical characteristics of cabled optical fibres		
Table 11 – Measuring methods for dimensions.....		
Table 12 – Measuring methods for electrical characteristics		
Table A.1 – Maximum single-mode cabled fibre attenuation coefficient (dB/km), as given by ITU-T		
Table A.2 – Category A1 multimode fibre maximum cable attenuation coefficient (dB/km)		
Table A.3 – Single-mode maximum cable attenuation coefficient (dB/km).....		
Table A.4 – Category A1 multimode cabled fibre bandwidth (MHz·km)		
Table A.5 – Guidance values for 1 625 nm type test acceptance criteria		
Table B.1 – Recommended minimum number of tested fibres in a cable.....		
Table C.1 – Preferred low and high temperature		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

Part 1-1: Generic specification – General

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.

This commented version (CMV) of the official standard IEC 60794-1-1:2023 edition 5.0 allows the user to identify the changes made to the previous IEC 60794-1-1:2015 edition 4.0. Furthermore, comments from IEC SC 86A experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 60794-1-1 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2015. This edition constitutes a technical revision.

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

- a) reorganization of the document to a more logical flow making it easier for the reader;
- b) expansion of the tables to include names and definitions of all documents in the IEC 60794-x series;
- c) expansion of the definitions, graphical symbols, terminology and abbreviations content, with the aim of making this document the default and reference for all others in the IEC 60794-x series;
- d) inclusion of updated, reorganized and expanded optical fibre, attenuation and bandwidth subclauses, with the aim of making this document the default and reference for all others in the IEC 60794-x series.

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

Draft	Report on voting
86A/2286/FDIS	86A/2313/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 document will remain unchanged until the stability date indicated on the IEC website under 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 document 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 1-1: Generic specification – General

1 Scope

This part of IEC 60794 applies to optical fibre cables for use with communication equipment and devices employing similar techniques ~~and to cables having a combination of both optical fibres and electrical conductors~~. Electrical properties are specified for optical ground wire (OPGW) and optical phase conductor (OPPC) cables. Hybrid communication cables are specified in the IEC 62807 series. **1**

The object of this document is to establish uniform generic requirements for the geometrical, transmission, material, mechanical, ageing (environmental exposure), climatic and electrical properties of optical fibre cables and cable elements, where appropriate.

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 60189-1, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*

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

IEC 60793-1-21, *Optical fibres – Part 1-21: Measurement methods and test procedures – Coating geometry*

IEC 60793-1-22, *Optical fibres – Part 1-22: Measurement methods and test procedures – Length measurement*

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

IEC 60793-1-44, *Optical fibres – Part 1-44: Measurement methods and test procedures – Cut-off wavelength*

IEC 60793-1-46, *Optical fibres – Part 1-46: Measurement methods and test procedures – Monitoring of changes in optical transmittance*

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 60793-2-10, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

IEC 60793-2-40:2021, *Optical fibres – Part 2-40: Product specifications – Sectional specification for category A4 multimode fibres*

~~IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode*~~

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

IEC 60794-1-22¹, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental tests methods*

IEC 60811-201, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 201: General tests – Measurement of insulation thickness*

IEC 60811-202, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath*

IEC 60811-203, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 203: General tests – Measurement of overall dimensions*

~~IEC TR 61931, *Fibre optic – Terminology*~~

~~ISO 14001, *Environmental management systems – Requirements with guidance for use*~~

~~ISO 14064-1, *Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*~~

¹ This document is progressively being replaced by the IEC 60794-1-2XX series.

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

Optokablar – Del 1-1: Artspecifikation – Allmänt

*Optical fibre cables –
Part 1-1: Generic specification –
General*

Som svensk standard gäller europastandarden EN IEC 60794-1-1:2023. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 60794-1-1:2023.

Nationellt förord

Europastandarden EN IEC 60794-1-1:2023

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60794-1-1, Fifth edition, 2023 - Optical fibre cables – Part 1-1: Generic specification – General**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 60794-1-1, utg 4:2016 med eventuella tillägg, ändringar och rättelser, gäller ej fr o m 2026-06-26.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English Version

Optical fibre cables - Part 1-1: Generic specification - General
(IEC 60794-1-1:2023)

Câbles à fibres optiques - Partie 1-1: Spécification
générique - Généralités
(IEC 60794-1-1:2023)

Lichtwellenleiterkabel - Teil 1-1: Fachgrundspezifikation -
Allgemeines
(IEC 60794-1-1:2023)

This European Standard was approved by CENELEC on 2023-06-26. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 86A/2286/FDIS, future edition 5 of IEC 60794-1-1, prepared by SC 86A "Fibres and cables" of IEC/TC 86 "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60794-1-1:2023.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2024-03-26
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-06-26

This document supersedes EN 60794-1-1:2016 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 60794-1-1:2023 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60793-2-50	NOTE Approved as EN IEC 60793-2-50
IEC 60794-1-1	NOTE Approved as EN 60794-1-1
IEC 60794-1-2	NOTE Approved as EN IEC 60794-1-2
IEC 60794-1-3	NOTE Approved as EN 60794-1-3
IEC 60794-1-23	NOTE Approved as EN IEC 60794-1-23
IEC 60794-1-24	NOTE Approved as EN 60794-1-24
IEC 60794-1-401	NOTE Approved as EN IEC 60794-1-401
IEC 60794-1-402	NOTE Approved as EN IEC 60794-1-402
IEC 60794-2 (series)	NOTE Approved as EN IEC 60794-2 (series)
IEC 60794-2-10	NOTE Approved as EN IEC 60794-2-10
IEC 60794-2-11	NOTE Approved as EN IEC 60794-2-11
IEC 60794-2-20	NOTE Approved as EN 60794-2-20
IEC 60794-2-21	NOTE Approved as EN IEC 60794-2-21

IEC 60794-2-22	NOTE Approved as EN IEC 60794-2-22
IEC 60794-2-30	NOTE Approved as EN IEC 60794-2-30
IEC 60794-2-31	NOTE Approved as EN IEC 60794-2-31
IEC 60794-2-40	NOTE Approved as EN 60794-2-40
IEC 60794-2-41	NOTE Approved as EN 60794-2-41
IEC 60794-2-42	NOTE Approved as EN 60794-2-42
IEC 60794-2-50	NOTE Approved as EN IEC 60794-2-50
IEC 60794-3 (series)	NOTE Approved as EN IEC 60794-3 (series)
IEC 60794-3-10	NOTE Approved as EN 60794-3-10
IEC 60794-3-11	NOTE Approved as EN 60794-3-11
IEC 60794-3-12	NOTE Approved as EN IEC 60794-3-12
IEC 60794-3-20	NOTE Approved as EN 60794-3-20
IEC 60794-3-21	NOTE Approved as EN 60794-3-21
IEC 60794-3-30	NOTE Approved as EN 60794-3-30
IEC 60794-3-40	NOTE Approved as EN IEC 60794-3-40
IEC 60794-3-70	NOTE Approved as EN IEC 60794-3-70
IEC 60794-4 (series)	NOTE Approved as EN IEC 60794-4 (series)
IEC 60794-4-10	NOTE Approved as EN 60794-4-10
IEC 60794-4-20:2018	NOTE Approved as EN IEC 60794-4-20:2018 (not modified)
IEC 60794-4-30	NOTE Approved as EN IEC 60794-4-30
IEC 60794-5 (series)	NOTE Approved as EN 60794-5 (series)
IEC 60794-5-10	NOTE Approved as EN 60794-5-10
IEC 60794-5-20	NOTE Approved as EN 60794-5-20
IEC 60794-6 (series)	NOTE Approved as EN IEC 60794-6 (series)
IEC 60794-6-10	NOTE Approved as EN IEC 60794-6-10
IEC 60794-6-20	NOTE Approved as EN IEC 60794-6-20
IEC 60794-6-30	NOTE Approved as EN IEC 60794-6-30
IEC 61753-1	NOTE Approved as EN IEC 61753-1
ISO 14001	NOTE Approved as EN ISO 14001
ISO 14064-1	NOTE Approved as EN ISO 14064-1

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60189-1	-	Low-frequency cables and wires with PVC insulation and PVC sheath - Part 1: General test and measuring methods	-	-
IEC 60304	-	Standard colours for insulation for low-frequency cables and wires	HD 402 S2	-
IEC 60793-1-21	-	Optical fibres - Part 1-21: Measurement methods and test procedures - Coating geometry	EN 60793-1-21	-
IEC 60793-1-22	-	Optical fibres - Part 1-22: Measurement methods and test procedures - Length measurement	EN 60793-1-22	-
IEC 60793-1-40	-	Optical fibres - Part 1-40: Attenuation measurement methods	EN IEC 60793-1-40	-
IEC 60793-1-44	-	Optical fibres - Part 1-44: Measurement methods and test procedures - Cut-off wavelength	EN 60793-1-44	-
IEC 60793-1-46	-	Optical fibres - Part 1-46: Measurement methods and test procedures - Monitoring of changes in optical transmittance	EN 60793-1-46	-
IEC 60793-1-48	-	Optical fibres - Part 1-48: Measurement methods and test procedures - Polarization mode dispersion	EN 60793-1-48	-
IEC 60793-2	-	Optical fibres - Part 2: Product specifications - General	EN IEC 60793-2	-
IEC 60793-2-10	-	Optical fibres - Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres	EN IEC 60793-2-10	-
IEC 60793-2-40	2021	Optical fibres - Part 2-40: Product specifications - Sectional specification for category A4 multimode fibres	EN IEC 60793-2-40	2021

IEC 60794-1-21	-	Optical fibre cables - Part 1-21: Generic specification - Basic optical cable test procedures - Mechanical tests methods	EN 60794-1-21	-
IEC 60794-1-22	-	Optical fibre cables - Part 1-22: Generic specification - Basic optical cable test procedures - Environmental test methods	EN IEC 60794-1-22	-
IEC 60811-201	-	Electric and optical fibre cables - Test methods for non-metallic materials - Part 201: General tests - Measurement of insulation thickness	EN 60811-201	-
IEC 60811-202	-	Electric and optical fibre cables - Test methods for non-metallic materials - Part 202: General tests - Measurement of thickness of non-metallic sheath	EN 60811-202	-
IEC 60811-203	-	Electric and optical fibre cables - Test methods for non-metallic materials - Part 203: General tests - Measurement of overall dimensions	EN 60811-203	-

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Optical fibre cables –
Part 1-1: Generic specification – General**

**Câbles à fibres optiques –
Partie 1-1: Spécification générique – Généralités**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.180.10

ISBN 978-2-8322-6709-7

Warning! Make sure that you obtained this publication from an authorized distributor. Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.
--

CONTENTS

FOREWORD	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Graphical symbols and abbreviated terms	12
5 Optical fibre cables – IEC 60794 structure	13
5.1 General	13
5.2 IEC 60794-1 series	13
5.3 IEC 60794-2 series	14
5.4 IEC 60794-3 series	14
5.5 IEC 60794-4 series	15
5.6 IEC 60794-5 series	15
5.7 IEC 60794-6 series	15
5.8 IEC 60794-7 series	16
6 Cable materials	16
6.1 Indoor cable materials	16
6.2 Outdoor cable materials	16
6.3 Indoor/outdoor cable materials	17
6.4 Environmental requirements for cable materials	17
7 Cable construction	17
7.1 General	17
7.2 Colour coding	17
7.2.1 Overview	17
7.2.2 Fibre colour coding	18
7.2.3 Unit colour coding	18
7.2.4 Sheath colour coding	18
7.3 Fibre	18
7.3.1 General	18
7.3.2 Attenuation coefficient	18
7.3.3 Attenuation uniformity – Attenuation discontinuities	18
7.3.4 Cable cut-off wavelength	18
7.3.5 Polarization mode dispersion (PMD)	19
7.4 Buffer tubes	19
7.5 Tensile strength elements	19
7.6 Crush protection elements	19
7.7 Water blocking elements	19
7.8 Sheath removal elements	19
7.9 Cable sheath	20
8 Measuring and test methods	20
8.1 General	20
8.2 Measuring methods for transmission and optical characteristics	20
8.3 Measuring methods for dimensions	20
8.4 Test methods for mechanical characteristics	21
8.5 Test methods for environmental characteristics	21
8.6 Test methods for cable element characterization	21
8.7 Measuring and test methods for electrical characteristics	21

Annex A (informative) Guidelines for specific optical fibre and cabled fibre performance	23
A.1 General.....	23
A.2 Cabled fibre attenuation requirements.....	23
A.3 Cabled fibre bandwidth requirements	24
A.4 Type testing at 1 625 nm.....	25
Annex B (informative) Guidelines for qualification sampling	26
B.1 General.....	26
B.2 Fibre selection for cable testing	26
B.3 Pass/fail criteria	27
Annex C (informative) Preferred temperatures	28
Bibliography.....	29
 Table 1 – IEC 60794 structure	 13
Table 2 – IEC 60794-1 series.....	14
Table 3 – IEC 60794-2 series.....	14
Table 4 – IEC 60794-3 series.....	15
Table 5 – IEC 60794-4 series.....	15
Table 6 – IEC 60794-5 series.....	15
Table 7 – IEC 60794-6 series.....	16
Table 8 – Indoor cables materials (examples)	16
Table 9 – Outdoor cable materials (examples)	17
Table 10 – Measuring methods for transmission and optical characteristics	20
Table 11 – Measuring methods for dimensions	21
Table 12 – Measuring methods for electrical characteristics.....	22
Table A.1 – Maximum single-mode cabled fibre attenuation coefficient (dB/km), as given by ITU-T	23
Table A.2 – Category A1- multimode fibre maximum cable attenuation coefficient (dB/km).....	24
Table A.3 – Single-mode maximum cable attenuation coefficient (dB/km)	24
Table A.4 – Category A1 multimode cabled fibre bandwidth (MHz·km)	25
Table A.5 – Guidance values for 1 625 nm type test acceptance criteria	25
Table B.1 – Recommended minimum number of tested fibres in a cable	26
Table C.1 – Preferred low and high temperature	28

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

Part 1-1: Generic specification – General

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.

IEC 60794-1-1 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2015. This edition constitutes a technical revision.

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

- a) reorganization of the document to a more logical flow making it easier for the reader;
- b) expansion of the tables to include names and definitions of all documents in the IEC 60794-x series;
- c) expansion of the definitions, graphical symbols, terminology and abbreviations content, with the aim of making this document the default and reference for all others in the IEC 60794-x series;

- d) inclusion of updated, reorganized and expanded optical fibre, attenuation and bandwidth subclauses, with the aim of making this document the default and reference for all others in the IEC 60794-x series.

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

Draft	Report on voting
86A/2286/FDIS	86A/2313/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 document will remain unchanged until the stability date indicated on the IEC website under 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.

OPTICAL FIBRE CABLES –

Part 1-1: Generic specification – General

1 Scope

This part of IEC 60794 applies to optical fibre cables for use with communication equipment and devices employing similar techniques. Electrical properties are specified for optical ground wire (OPGW) and optical phase conductor (OPPC) cables. Hybrid communication cables are specified in the IEC 62807 series.

The object of this document is to establish uniform generic requirements for the geometrical, transmission, material, mechanical, ageing (environmental exposure), climatic and electrical properties of optical fibre cables and cable elements, where appropriate.

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 60189-1, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*

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

IEC 60793-1-21, *Optical fibres – Part 1-21: Measurement methods and test procedures – Coating geometry*

IEC 60793-1-22, *Optical fibres – Part 1-22: Measurement methods and test procedures – Length measurement*

IEC 60793-1-40, *Optical fibres – Part 1-40: Attenuation measurement methods*

IEC 60793-1-44, *Optical fibres – Part 1-44: Measurement methods and test procedures – Cut-off wavelength*

IEC 60793-1-46, *Optical fibres – Part 1-46: Measurement methods and test procedures – Monitoring of changes in optical transmittance*

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 60793-2-10, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

IEC 60793-2-40:2021, *Optical fibres – Part 2-40: Product specifications – Sectional specification for category A4 multimode fibres*

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

IEC 60794-1-22¹, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental tests methods*

IEC 60811-201, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 201: General tests – Measurement of insulation thickness*

IEC 60811-202, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath*

IEC 60811-203, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 203: General tests – Measurement of overall dimensions*

¹ This document is progressively being replaced by the IEC 60794-1-2XX series.