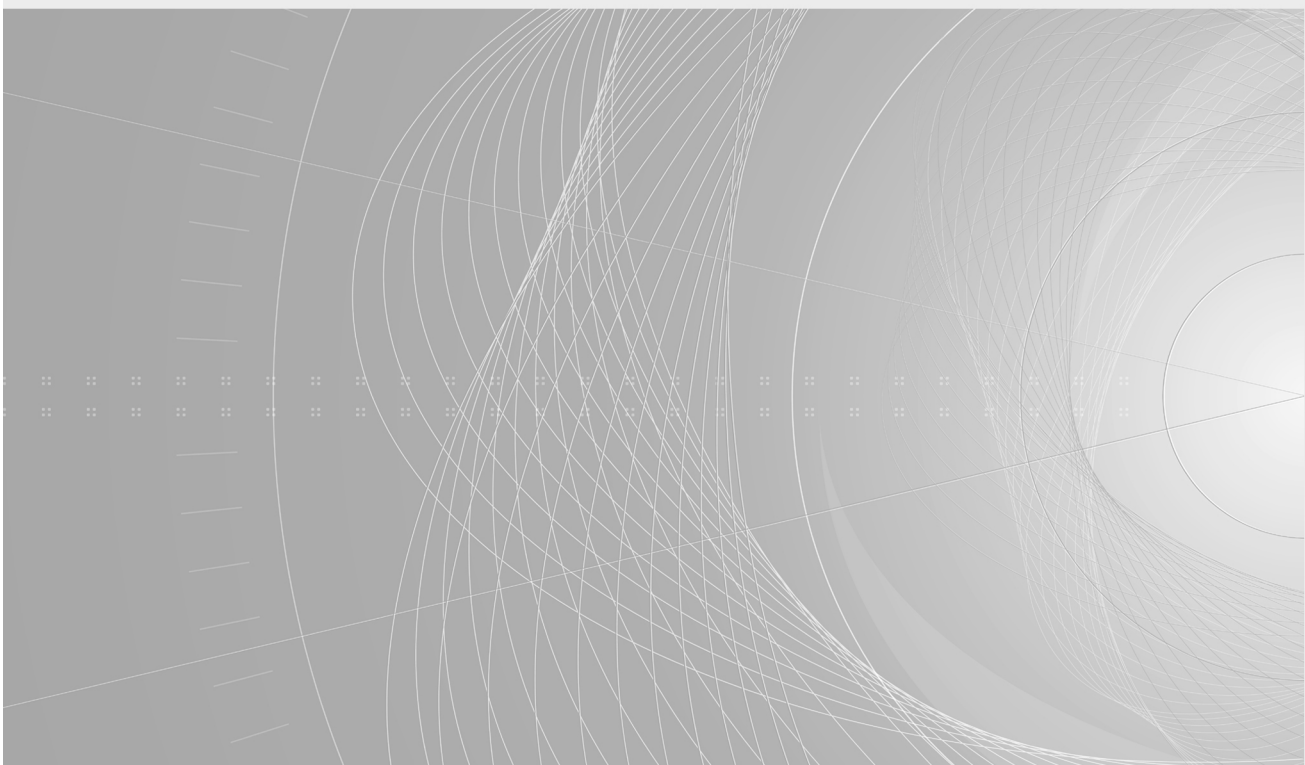


INTERNATIONAL STANDARD

NORME INTERNATIONALE

Optical fibre cables – **STANDARD PREVIEW**
Part 1-2: Generic specification – Basic optical cable test procedures – General
guidance (standards.iteh.ai)

Câbles à fibres optiques – [IEC 60794-1-2:2021](https://standards.iteh.ai/catalog/standards/sist/414bd9f9-d091-4773-a080-100000000000/iec-60794-1-2-2021)
Partie 1-2: Spécification générique – Procédures fondamentales d'essais des
câbles optiques – Recommandations générales





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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures – General guidance

Câbles à fibres optiques – Partie 1-2: Spécification générique – Procédures fondamentales d'essais des câbles optiques – Recommandations générales

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CONTENTS

FOREWORD	3
INTRODUCTION	5
1 Scope	6
2 Normative references	7
3 Terms and definitions	7
4 General guidance	7
4.1 Test procedure format	7
4.2 Standard atmospheric conditions	7
4.3 Symbols and abbreviated terms	8
4.4 Safety and environmental aspects	8
4.5 Calibration	8
4.5.1 Calibration process	8
4.5.2 Assessment of uncertainties	8
4.6 Preconditioning	9
4.7 Guide to qualification sampling	9
4.8 Optical launch conditions	9
4.9 Standard optical test wavelengths	9
Annex A (informative) Cross-references between new and old test method numbers	10
Bibliography	16
Table 1 – Document overview	6
Table 2 – Standard optical test wavelengths	9
Table 3 – Alternative optical test wavelengths	9
Table A.1 – IEC 60794-1-1xx series	10
Table A.2 – IEC 60794-1-2xx series	11
Table A.3 – IEC 60794-1-3xx series	12
Table A.4 – IEC 60794-1-4xx series	12
Table A.5 – IEC 60794-1-21 method numbers	12
Table A.6 – IEC 60794-1-22 method numbers	14
Table A.7 – IEC 60794-1-23 method numbers	14
Table A.8 – IEC 60794-1-24 method numbers	15

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

**Part 1-2: Generic specification –
Basic optical cable test procedures –
General guidance**

FOREWORD

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International Standard IEC 60794-1-2 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This fifth edition cancels and replaces the fourth edition published in 2017. This edition constitutes a technical revision.

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

- a) addition of cross-reference tables listing the new test method numbers and the previous test method numbers.

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

CDV	Report on voting
86A/2009/CDV	86A/2057/RVC

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 International Standard is to be used in conjunction with IEC 60794-1-1.

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 document 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 document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

A decision has been reached to reorganize the IEC 60794-1-2 set of test methods into single-subject documents. This will be a migration as the existing test methods are revised and as new test methods are promulgated, rather than a wholesale rewrite. Part of this migration is a decision to maintain the traditional letter-number classification and to use a numbering system which maintains connection to the existing numbering system.

The new test method numbering format has been agreed, in line with IEC Secretariat guidelines, to help the cross-referencing from old to new and that will make the updating of the relevant sectional and product specifications easier. Cross-reference tables listing the new test method numbers and the previous test method numbers have been included (see Annex A, Table A.1 to Table A.8).

The format agreed is as follows:

IEC 60794-1-Xnn

where

X = 2nd digit of the old 2-digit reference;

nn = incremental number (starting with old test method number).

For example:

IEC 60794-1-21 method E1 (tensile) becomes IEC 60794-1-101;

IEC 60794-1-22 method F5 (water penetration) becomes IEC 60794-1-205;

IEC 60794-1-23 method G7 (tube kinking) becomes IEC 60794-1-307;

IEC 60794-1-24 method H2 (lightning) becomes IEC 60794-1-402.

Annex A has been added to this document containing a cross-reference between the old and new number scheme.

OPTICAL FIBRE CABLES –

Part 1-2: Generic specification – Basic optical cable test procedures – General guidance

1 Scope

This part of IEC 60794-1 applies to optical fibre cables for use with telecommunications equipment and devices employing similar techniques, and to cables having a combination of both optical fibres and electrical conductors.

An objective of this document is to define general requirements and methodology guidance applicable to all of the cable test methods of IEC 60794-1 (all parts).

A second objective of this document is to provide the end user with an overview of the different test methods contained in the different parts of the IEC 60794-1 series, numbered -Xnn. Table 1 shows the different parts.

Table 1 – Document overview

Test methods	IEC reference	Previous compendium reference	Test method category reference letter
General guidance	IEC 60794-1-2	IEC 60794-1-2	-
Mechanical	IEC 60794-1-1nn	IEC 60794-1-21:2015	Methods E
Environmental	IEC 60794-1-2nn	IEC 60794-1-22:2017	Methods F
Cable elements	IEC 60794-1-3nn	IEC 60794-1-23:2019	Methods G
Electrical	IEC 60794-1-4nn	IEC 60794-1-24:2014	Methods H

NOTE 1 The compendium reference specifications detailed in column 3 will continue in force until all of the test methods therein are revised into the single-subject documents using the new numbering scheme.

NOTE 2 For existing test methods, "nn" is the test method number. For new test methods, "nn" is an incremental number following the last test method number for that test category.

NOTE 3 Several numbers in the test method numbering sequence are missing. The reasons for these omissions are historical. To avoid confusion, the existing numbering sequence has been retained.

These documents define test procedures to be used in establishing uniform requirements for the geometrical, transmission, material, mechanical, ageing (environmental exposure) and climatic properties of optical fibre cables, and electrical requirements where appropriate.

Throughout the documents, the wording "optical cable" can also include optical fibre units, microduct fibre units, etc.

The secondary objective of this document is to provide the end user with useful guidance when testing optical fibre cables.

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

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

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

IEC 60794-1-1, *Optical fibre cables – Generic specification – General*

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

IEC 60794-1-22:2017, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental test methods*

IEC 60794-1-23:2019, *Optical fibre cables – Part 1-23: Generic specification – Basic optical cable test procedures – Cable element test methods*

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

<https://standards.iteh.ai/catalog/standards/sist/414bd9f9-d091-4773-a080-bc9cc4ba6131/iec-60794-1-2-2021>

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60794-1-1 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>

4 General guidance

4.1 Test procedure format

The standard descriptive order of each test method is in general as follows: object, sample, apparatus, procedure, requirement, details to be specified, details to be reported. Additional clauses may be inserted, whilst maintaining this general order.

4.2 Standard atmospheric conditions

Two sets of allowable ambient conditions for cable testing are defined for use in testing in this document:

- a) Standard test conditions
 - temperature: $+23\text{ °C} \pm 5\text{ °C}$
 - pressure: site ambient

- relative humidity: 20 % to 70 %

b) Expanded test conditions

- temperature: $+25\text{ °C} \pm 15\text{ °C}$
- pressure: site ambient
- relative humidity: 5 % to 95 %

Unless otherwise stated in the particular test, the expanded test conditions shall be used as the default atmospheric conditions when performing tests. The standard test conditions are only for use when specifically requested.

NOTE A tightly-controlled temperature range is considered unnecessary for most cable tests.

Consideration shall be given to the effects of temperature differences and variations on electronic and optical test equipment that may be used in performing the tests. It may be necessary to maintain such equipment at the controlled atmospheric conditions by appropriate means.

4.3 Symbols and abbreviated terms

Symbols and abbreviated terms are given in IEC 60794-1-1.

4.4 Safety and environmental aspects

All applicable safety and environmental regulations shall be met.

4.5 Calibration

4.5.1 Calibration process

Ensure the apparatus is calibrated and adjusted in accordance with the manufacturer's instructions before use in order to minimize measurement uncertainty.

Record relevant information of the calibration process, such as the calibrated value and uncertainty of the reference material or test equipment used.

4.5.2 Assessment of uncertainties

Measurement uncertainty may be defined as the range within which the true value of a measured quantity (the measure) is estimated to lie, within a given likelihood (or confidence level) [1]¹. The measurement uncertainty normally comprises several components, some of which may be estimated using statistical techniques (known as type A uncertainties) whilst others may be estimated on the basis of experience or other information (known as type B uncertainties). Components of uncertainty, or variance, are additive, and a confidence interval may be calculated for the measurements based on the sum of the variance components.

A typical build-up of uncertainty may include the following sources of uncertainty:

- calibration uncertainty of reference materials or equipment used – normally stated on the calibration certificates of the standards;
- transfer uncertainty – estimated changes in the certified values of reference materials or equipment since they were calibrated;
- operational uncertainty – estimated effects of environmental conditions, such as temperature and humidity;

¹ Numbers in square brackets refer to the Bibliography.

- statistical (random) uncertainty in the measurement of the specimen and the calibration standard – due to, for example, electrical noise, vibration, data quantization, etc.

4.6 Preconditioning

Most tests are performed at ambient conditions or begin at ambient conditions, in accordance with 4.2. The intent is that the preconditioning achieve thermal stability. Some test methods address thermal stability in an explicit and detailed manner. Unless otherwise specified, samples shall be preconditioned at ambient conditions for a minimum of 12 h prior to the test.

4.7 Guide to qualification sampling

For qualification purposes, it should only be necessary to test a subset of the fibre and/or element counts that represent a product range. Not all fibres within a cable are required to be tested to qualify a cable. A guide to qualification sampling is found in IEC 60794-1-1. Not all tests are required for a cable design. It depends upon the application and relevant specification.

4.8 Optical launch conditions

Optical measurements shall follow conditions as described in IEC 60793-1-40 for attenuation and IEC 60793-1-46 for monitoring changes in optical transmittance by transmitted power or backscattering.

4.9 Standard optical test wavelengths

The standard optical test wavelengths for type testing of cabled optical fibre, performed in accordance IEC 60794-1-1, are as given in Table 2, unless otherwise specified in the individual test or in the detail specification.

Table 2 – Standard optical test wavelengths

Fibre type	Wavelength
Single-mode	1 550 nm ± 10 nm
Multimode	1 300 nm ± 20 nm
NOTE Other test wavelengths can require different tolerance ranges.	

Single-mode fibres which are specified for performance in the L band are tested at 1 625 nm, as given in Table 3. In this case, specific performance criteria shall be specified at 1 625 nm by the relevant specification.

For multimode fibres that are optimized for wavelengths lower than 1 300 nm (e.g. 850 nm, as given in Table 3), the highest specified wavelength shall be tested. In this case, the 1 300 nm test criteria specified in the relevant specification shall be used. Category A4 multimode fibres shall be tested at the applicable sub-category wavelength given in IEC 60793-2-40.

Table 3 – Alternative optical test wavelengths

Fibre type	Wavelength
Single-mode	1 625 nm ± 10 nm
Multimode	850 nm ± 20 nm
NOTE Other test wavelengths can require different tolerance ranges.	

Specified changes in optical performance include an allowance for measurement repeatability.

Annex A (informative)

Cross-references between new and old test method numbers

Table A.1 to Table A.8 show the cross-references between new and old test method numbers.

Table A.1 – IEC 60794-1-1xx series

New IEC 60794-1-1xx series number	Title	IEC 60794-1-21 method number
IEC 60794-1-101	Tensile performance	Method E1
IEC 60794-1-102	Abrasion	Method E2
	Method A: Abrasion resistance of optical fibre cable sheaths	Method E2A
	Method B: Abrasion resistance of optical fibre cable markings	Method E2B
IEC 60794-1-103	Crush	Method E3
	Method A: Plate/plate	Method E3A
	Method B: Mandrel/plate	Method E3B
IEC 60794-1-104	Impact	Method E4
IEC 60794-1-105	Stripping force stability of cabled optical fibres	Method E5A
IEC 60794-1-106	Repeated bending	Method E6
IEC 60794-1-107	Torsion	Method E7
IEC 60794-1-108	Flexing	Method E8
-	Snatch (deleted)	Method E9
IEC 60794-1-110	Kink	Method E10
IEC 60794-1-111	Bend	Method E11
	Method A: Standard test procedure	Method E11A
	Method B: Alternative test procedure	Method E11B
-	Cut-through resistance (deleted)	Method E12
IEC 60794-1-113	Shotgun damage	Method E13
	Method A: Shotgun test	Method E13A
	Method B: Shotgun simulation	Method E13B
-	[Title unknown] (deleted)	Method E16
IEC 60794-1-117	Bending stiffness	Method E17
	Method A: Three-point bend	Method E17A
	Method B: Cantilever bend	Method E17B
	Method C: Buckling bend	Method E17C
IEC 60794-1-118	Bending under tension	Method E18A
IEC 60794-1-119	Aeolian vibration	Method E19
IEC 60794-1-120	Cable coiling performance	Method E20
IEC 60794-1-121	Sheath pull-off force for optical fibre cable for use in patch cords	Method E21
IEC 60794-1-122	Buffered fibre movement under compression in optical fibre cables for use in patch cords	Method E22
IEC 60794-1-123	Microduct route verification test	Method E23
IEC 60794-1-124	Installation test for microduct cabling	Method E24