

INTERNATIONAL STANDARD



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



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Mechanical test methods**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

**Part 1-21: Generic specification –
Basic optical cable test procedures –
Mechanical test methods**

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International Standard IEC 60794-1-21 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This first edition of IEC 60794-1-21 cancels and replaces the mechanical tests part of the second edition of IEC 60794-1-2, published in 2003. It constitutes a technical revision.

It has been decided to split the second edition of IEC 60794-1-2 into six new documents:

- IEC 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures*
- IEC 60794-1-20, *Optical fibre cables – Part 1-20: Generic specification – Basic optical cable test procedures – General and definitions*

- IEC 60794-1-21, *Optical fibre cables – Part 1-21: Generic specification – Basic optical cable test procedures – Mechanical tests methods*
- IEC 60794-1-22, *Optical fibre cables – Part 1-22: Generic specification – Basic optical cable test procedures – Environmental tests methods*
- IEC 60794-1-23, *Optical fibre cables – Part 1-23: Generic specification – Basic optical cable test procedures – Cable elements tests methods*
- IEC 60794-1-24, *Optical fibre cables – Part 1-24: Generic specification – Basic optical cable test procedures – Electrical tests methods*

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

FDIS	Report on voting
86A/1638/FDIS	86A/1655/RVD

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.

This standard is intended to be used in conjunction with IEC 60794-1-1.

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.

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OPTICAL FIBRE CABLES –

Part 1-21: Generic specification – Basic optical cable test procedures – Mechanical test methods

1 Scope and object

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

The object of this standard is to define test procedures to be used in establishing uniform requirements for mechanical requirement performance.

Throughout this standard the wording “optical cable” may also include optical fibre units, microduct fibre units, etc.

General requirements and definitions are given in IEC 60794-1-20 and a complete reference guide to test method of all types in the IEC 60794-1-2.

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 60227-2, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods*

IEC 60793-1-22:2001, *Optical fibres – Part 1-22: Measurement methods and test procedures – Length measurement*

IEC 60793-1-32:2010, *Optical fibres – Part 1-32: Measurement methods and test procedures – Coating strippability*

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

IEC 60793-1-46:2001, *Optical fibres – Part 1-46: Measurement methods and test procedures – Monitoring of changes in optical transmittance*

IEC 60794-1-1, *Optical fibres – Part 1-1: Generic specification – General*

IEC 60794-1-2:2013, *Optical fibre cables – Part 1-2: Generic specification – Cross reference table for optical cable test procedures*

IEC 60794-1-20:2014, *Optical fibre cables – Part 1-20: Generic specification – Basic optical cable test procedures – General and definitions*

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

IEC TR 62691, *Guide to the installation of optical fibre cables*

IEC 61300-2-44, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-44: Tests – Flexing of the strain relief of fibre optic devices*

3 Method E1: Tensile performance

3.1 Object

This test method applies to optical fibre cables which are tested at a particular tensile strength in order to examine the behaviour of the attenuation and/or the fibre elongation strain as a function of the load on a cable which may occur during installation and operation. This method is intended to be non-destructive.

3.2 Sample length

Length under tension ≥ 50 m unless otherwise defined in the relevant specification. For cables requiring specialized anchoring devices (e.g. OPGW, all-dielectric self-supporting (ADSS), heavy wire armored cables, etc.), the minimum length shall be 25 m.

Short lengths in the tensile test will adversely affect the accuracy of the measurement. The lengths shown above are the recommended minimum lengths for this test.

Total sample length is longer than the length under tension to allow for clamping and connection to test equipment.

3.3 Apparatus

The apparatus consists of

- a) an attenuation measuring apparatus for the determination of attenuation changes (see IEC 60793-1-40), and/or a fibre elongation strain measuring apparatus (see IEC 60793_1_22:2001, Method C: Fibre elongation);
- b) a tensile strength measuring apparatus which is able to accommodate the minimum length to be tested. Transfer devices may be used for testing longer samples under tension (see Figure 2). The diameters of sheaves in the transfer device shall be no smaller than the minimum bending diameter of the cable under test; typically 1 m diameter;
- c) a load cell with a maximum error of ± 3 % of its maximum range;
- d) a clamping device to secure all cable components at the ends of the length under test: care should be taken that the specific method of capturing the cable components does not affect the results. A mandrel is frequently an appropriate device, with a diameter typically 1 m, but not less than the minimum bending diameter specified for the cable;
- e) if required, mechanical or electrical means for measuring the cable load or elongation, per the detail specification shall be provided.

Examples of suitable apparatus are shown in Figure 1 and Figure 2.

3.4 Procedure

3.4.1 General requirements

- a) Unless otherwise specified, the conditions for testing shall be in accordance with the expanded test conditions as defined in IEC 60794-1-20.