IEC 60794-1-312

Edition 1.0 2024-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Optical fibre cables –
Part 1-312: Generic specification – Basic optical cable test procedures – Cable element test methods – Elongation test for buffer tubes at low temperature, Method G11B

Câbles à fibres optiques –
Partie 1-312: Spécification générique – Procédures fondamentales d'essai des câbles optiques – Méthodes d'essais d'environnement – Essai d'allongement des tubes à basse température, Méthode G11B

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

Part 1-312: Generic specification – Basic optical cable test procedures – Cable element test methods – Elongation test for buffer tubes at low temperature, method G11B

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IEC 60794-1-312 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is an International Standard.

This document partially cancels and replaces method G11B of IEC 60794-1-23:2019.

This edition includes the following significant technical changes with respect to IEC 60794-1-23:2019:

- alignment of the title with the content of the method.

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

Draft	Report on voting
86A/2395/FDIS	86A/2414/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, or
- revised.

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INTRODUCTION

This document contains method G11B of IEC 60794-1-23:2019, which will be withdrawn. The title of the test method G11B and the content were not in line with each other. In the title micro tubes are mentioned, but the text stated that the test is intended for buffer tubes circular cross-section having an external diameter greater than 12,5 mm and for sector-shaped cores large enough to prepare dumb-bells. In the new title, micro tubes are skipped with respect to IEC 60794-1-23:2019.

The system for optical fibre test methods have been restructured and renumbered. The optical cable element test methods contained in IEC 60794-1-23:2019 will now be individually numbered in the IEC 60794-1-3xx series. Each test method is now considered to be an individual document rather than part of a multi-test method compendium. Full cross-reference details are given in IEC 60794-1-2.

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OPTICAL FIBRE CABLES –

Part 1-312: Generic specification – Basic optical cable test procedures – Cable element test methods – Elongation test for buffer tubes at low temperature, method G11B

1 Scope

This part of IEC 60794 describes test procedures to be used in establishing uniform requirements of optical fibre cable elements for the mechanical property – tensile strength and elongation at low temperature.

This document 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.

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

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

IEC 60811-401, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in an air oven*

IEC 60811-501, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and sheathing compounds*

IEC 60811-505, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 505: Mechanical tests – Elongation at low temperature for insulations and sheaths*

3 Terms and definitions

No terms and definitions are listed in this document.

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

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4 General requirements

IEC 60794-1-2 is the reference guide to test methods of all types. It shall be considered for general requirements and definitions.

5 Method G11B: Elongation of buffer tubes at low temperature

5.1 Object

This test is to determine the elongation of the buffer tubes at low temperature. For this test, the test method IEC 60811-501, IEC 60811-505 and IEC 60811-401 shall apply.

5.2 Sample

5.2.1 General

Each buffer tube to be tested shall be represented by two samples of suitable length.

5.2.2 Preparation and conditioning of test pieces

After all covering has been removed, the buffer tube shall be cut open in the direction of the axis, after which the fibre and any filling compound, if any, shall be removed.

Dumb-bell test pieces are intended for buffer tubes circular cross-section having an external diameter greater than 12,5 mm and for sector-shaped cores large enough to prepare dumb-bells. Where it is not possible to prepare dumb-bells, the tubular test pieces as described below are suitable for testing the performance of cores of smaller diameter.

a) Conditioning of test pieces

1) Elevated temperature conditioning

NOTE 1 Elevated temperature conditioning is not an ageing treatment. It is used as a means of ensuring stable and consistent test pieces when required. It is used a) when called for in the relevant cable standard, or b) if there is a doubt or disagreement about a result and the test needs to be repeated. In either case, the conditioning applies only to the test piece as taken from the cable before any subsequent treatment (ageing, compatibility test, oil immersion, etc.).

Where conditioning at elevated temperature is used, such conditioning shall be carried out as follows:

– for dumb-bells:

i) after the removal of the buffer tube from the cable but before the cutting of strips;

ii) after grinding (or cutting) to obtain parallel surfaces. Where grinding (or cutting) is not needed, the conditioning shall be performed at the point in the test protocol according to i);

– for tubular test pieces: after removal of the fibre, and any filling compound, but before applying the reference marks, if any, for measurement of the extension.

Where the relevant cable standard calls for conditioning at elevated temperature, it shall be for the time and temperature given in that standard. Where, in case of doubt, the test has to be repeated, the conditioning shall be 24 h at 70 °C ± 2 °C, or a lower temperature corresponding to the maximum operating temperature of the cable.

2) Room temperature conditioning

Before determination of the cross-sectional area, all test pieces shall be protected from direct sunlight and maintained for at least 3 h at a temperature of 23 °C ± 5 °C.

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b) Dumb-bell test pieces

Dumb-bell test pieces shall be used whenever possible. They shall be prepared from samples of buffer tube, cut open in the direction of the axis.

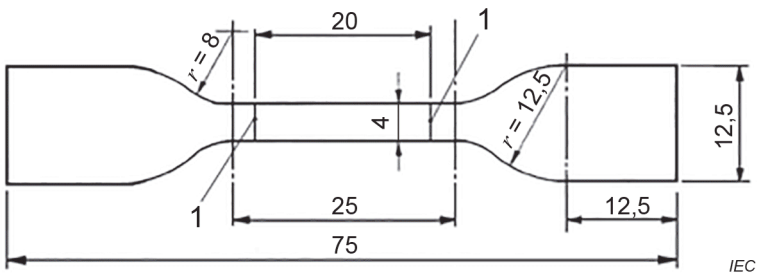
Each sample of buffer tube shall be cut into strips of an appropriate length. The strips shall be marked to identify the sample from which they are cut and their positions relative to each other in the original sample.

The strips of buffer tube shall be ground or cut, so as to obtain two parallel smooth surfaces between the reference marks mentioned below, care being taken to avoid undue heating. An example of a cutting machine is given in 5.3. For polyethylene (PE) and polypropylene (PP) buffer tube, cutting only, not grinding, shall be employed. After cutting or grinding, including any removal of burrs, the thickness of the strips shall not be less than 0,8 mm and not more than 2,0 mm. If it is not possible to prepare dumb-bell test pieces that comply with the minimum thickness of 0,8 mm, then tubular test pieces shall be used. If tubular test pieces cannot be prepared, then dumb-bells thinner than 0,8 mm may be used, but the rate of separation shall be 25 mm/min.

The test report should also include the fact that non-compliant dumb-bells were used and that the result is indicative.

A dumb-bell test piece, in accordance with Figure 1 or Figure 2, shall then be punched from each prepared strip of buffer tube, or if possible, two dumb-bell test pieces shall be punched side by side.

Dimension in millimeters



Key

1 reference marks

Figure 1 – Dumb-bell test piece

In order to improve the reliability of the results, the following is recommended:

– the punch should be very sharp to minimize imperfections in the test piece;

– a cardboard or other suitable support should be placed between the strip and the base plate; this support shall be marked during punching, but not completely cut through by the punch;

– burrs on the sides of the test piece should be avoided.

For materials where punching results in burrs, the following method may be used:

1) each end of the punch shall have a groove approximately 2,5 mm wide and 2,5 mm high (see Figure 3);

2) the cut dumb-bell test pieces shall remain attached at both ends with the strip previously prepared according to the requirements of 5.2.2 b) (see Figure 4);

3) with the machine given in 5.3, an additional 0,10 mm to 0,15 mm thickness can be cut away to remove possible burrs resulting from the dumb-bell punch; when this operation is completed, the dumb-bell test pieces shall be cut through at their ends in order to remove them from the strip.

When the diameter of the core is too small to allow the dumb-bell to be cut in accordance with Figure 1, then a smaller dumb bell test piece in accordance with Figure 2 shall be punched from each prepared strip.

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