

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Optical fibre cables –  
Part 1-104: Generic specification – Basic optical cable test procedures –  
Mechanical tests method – Impact, method E4**

**Câbles à fibres optiques –  
Partie 1-104: Spécification générique – Procédures fondamentales d’essais des  
câbles optiques – Méthodes d’essais mécaniques – Chocs, méthode E4**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## OPTICAL FIBRE CABLES –

**Part 1-104: Generic specification –  
Basic optical cable test procedures –  
Mechanical tests methods – Impact, method E4**

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IEC 60794-1-104 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This document partially cancels and replaces IEC 60794-1-21:2015, which will be withdrawn. In the context of the revision of IEC 60794-1-21:2015, its contents were split into separate test methods. It includes an editorial revision, based on the new structure and numbering system for optical fibre cable test methods.

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

Draft	Report on voting
86A/2360/CDV	86A/2421/RVC

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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

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## INTRODUCTION

This document cancels and replaces test method E4 of IEC 60794-1-21:2015, which will be withdrawn. It includes an editorial revision, based on the new structure and numbering system for optical fibre cable test methods. The mechanical tests contained in IEC 60794-1-21:2015 will be individually numbered in the IEC 60794-1-1xx 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 1-104: Generic specification – Basic optical cable test procedures – Mechanical tests methods – Impact, method E4

#### 1 Scope

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.

This document defines test procedures to be used in establishing uniform requirements for impact performance.

Throughout this document the wording “optical cable” includes optical fibre units, microduct fibre units, etc.

See IEC 60794-1-2 for general requirements and definitions and for a complete reference guide to test methods of all types.

#### 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.

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

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

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

#### 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 terminology databases for use in standardization at the following addresses:

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



## 4 Method E4: Impact

### 4.1 Object

The purpose of this test is to determine the ability of an optical fibre cable to withstand impact.

### 4.2 Sample

#### 4.2.1 Sample length

The sample length shall be sufficient to carry out the specified test. When only physical damage is to be evaluated, the length can range from 1 m (i.e. small diameter jumper cords or duplex cables) to 5 m (i.e. larger diameter cables). Longer lengths can be necessary to permit optical measurements.

#### 4.2.2 Termination

The sample shall be terminated at each end in a connector, or in a manner such that the fibres, sheathings and any strain members are clamped together in a representative manner. Clamps on the impact apparatus can be used, or the sample can be long enough so that no restraint is necessary.

### 4.3 Apparatus

The apparatus shall allow an impact to be imparted to the cable sample which is fixed to a flat steel base which is solidly mounted such that no visual motion is detected during test. When a single or only a few impacts are required, a suitable apparatus, as shown in Figure 1a, is used. This allows a hammer with the required weight to drop vertically onto a piece of steel which transmits the impact to the cable sample. When repeated impacts are required (e.g. more than five), a more practical apparatus, as shown in Figure 1b, is used, which allows multiple impacts by a drop hammer. The apparatus shall be arranged to impart minimal friction to the moving hammer.

NOTE This issue of friction has been found to be a particular problem when the apparatus is used at temperature extremes.

In both cases, other equivalent apparatus can also be used.

The striking surface shall either be flat or have a curved surface with curvature radius of  $\geq 300$  mm. If using a flat striking surface, the edges of the face shall be curved to avoid a stress concentration riser, as shown in Figure 1c, detail b). If using a 300 mm curvature radius striking surface, then the surface can also be a spherical segment, as shown in Figure 1c, detail a), since for such a large curvature radius this provides an equivalent test method to that when using a rounded cylinder.

The radius on the edge on the flat striking surface and on the 300 mm curvature radius striking surface shall be approximately 0,5 mm.

The apparatus shall include any optical test equipment necessary to measure the changes in optical performance as required in the detail specification and specified in method A (transmitted power) of IEC 60793-1-46.

### 4.4 Procedure

The conditions for testing shall be in accordance with standard atmospheric conditions as defined in IEC 60794-1-2.

The mass of the drop hammer and the height from which it falls shall be adjusted to give the value of impact energy shown in the detail specification. The number and rate of impacts, and their location on the sample shall be as specified in the detail specification. For more than one impact, the location of each impact is to be at different places on the cable sample, typically spaced  $\geq 500$  mm apart.

#### 4.5 Requirements

The acceptance criteria for the test shall be as stated in the detail specification. Typical failure modes include loss of optical continuity or change in attenuation beyond specified value, and physical damage to the cable that does not affect the function of the cable.

#### 4.6 Details to be specified

The detail specification shall include the following:

- a) number of impacts;
- b) impact energy;
- c) test temperature;
- d) radius of the striking surface if other than specified herein;
- e) frequency of multiple impacts (if any);
- f) location of impacts on the sample;
- g) whether optical continuity or change in attenuation is to be measured.

#### 4.7 Details to be reported

The test report shall include all the information given in 4.6 and, where applicable, the following:

- a) detailed description of sample (cable type);
- b) length of sample;
- c) type of fixing of all cable elements at both ends, if any;
- d) number of samples;
- e) description of the test set-up;
- f) description of the optical measurement equipment;
- g) preconditioning procedure, if any.