

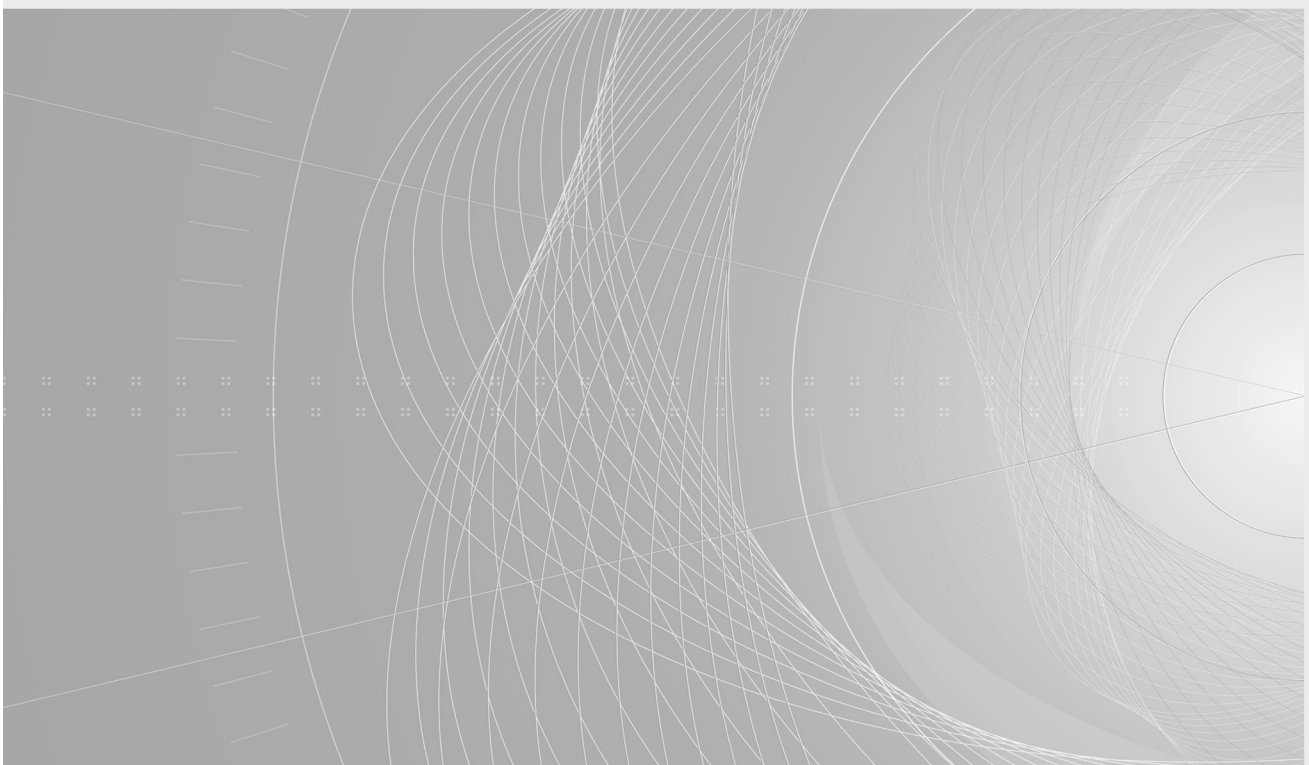
INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Optical fibre cables –
Part 1-212: Generic specification – Basic optical cable test procedures –
Environmental test methods – Temperature cycling with cable elements fixed at
both ends, Method F12**

**Câbles à fibres optiques –
Partie 1-212: Spécification générique – Procédures fondamentales d’essais des
câbles optiques – Méthodes d’essais d’environnement – Cycle de température
avec éléments de câble fixés aux deux extrémités, Méthode F12**





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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

**Part 1-212: Generic specification – Basic optical cable test procedures –
Environmental test methods – Temperature cycling with cable elements
fixed at both ends, method F12**

FOREWORD

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IEC 60794-1-212 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 60794-1-22:2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 60794-1-22:2017:

- a) the description of the test method has been changed to “with cable elements fixed at both ends”;
- b) subclauses have been added to the procedure clause;

- c) the preparation of cable sample and test set-up has been arranged in a logical way;
- d) Figure 1 has been added for illustration of the preparation of cable sample, DUT and test set-up;
- e) the temperature chamber temperature tolerance has been changed to ± 3 °C as done in IEC 60794-1-22, method F1;
- f) all required steps have been added to the subclause for temperature cycling as well as the table for the minimum soak time and the figure for the cycle procedure, and removed the reference to IEC 60794-1-22, method F1;
- g) the maximum change in attenuation has been added to the details to be specified;
- h) a new subclause 4.5 has been added for details to be reported.

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

| Draft | Report on voting |
|--------------|------------------|
| 86A/2357/CDV | 86A/2409/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. 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 defines the test method F12 to measure the attenuation behaviour (change in attenuation) when an optical fibre cable with cable elements fixed at both ends is subjected to temperature cycling. This test assesses the attenuation behaviour of a cable under a no-end movement condition intended for termination with, for example, connectors or passive components.

This document cancels and replaces method F12 of IEC 60794-1-22:2017, which will be withdrawn. It includes an editorial revision, based on the new structure and numbering system for optical fibre cable test methods. Additionally, technical changes were implemented. The environmental tests contained in IEC 60794-1-22:2017 will be individually numbered in the IEC 60794-1-2xx 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.

The main performance of a terminated cable is the optical transmission performance during environmental variations (i.e. during temperature changes). Therefore, the test method F12 is recommended to be performed for cables intended to be terminated with connectors. Moreover this method can be optionally used as an indicator for cables terminated with hardened connectors or fixed into a module and the fibres terminated with connectors.

IEC TR 62959 provides information on cable shrinkage characterisation of optical fibre cables that consist of standard glass optical fibres for telecommunication applications. The characterisation is directed to the effects of cable shrinkage or cable element shrinkage on the termination of cables. Recommended test methods for the evaluation of cable shrinkage are provided and classification using a “grading” system are given as guidance.

Document Preview

[IEC 60794-1-212:2024](https://standards.iteh.ai/catalog/standards/iec/09dbdeda-15a3-40d6-9541-c2a57ec7fc03/iec-60794-1-212-2024)

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OPTICAL FIBRE CABLES –

Part 1-212: Generic specification – Basic optical cable test procedures – Environmental test methods – Temperature cycling with cable elements fixed at both ends, method F12

1 Scope

This part of the IEC 60794 series defines the test procedure to examine the attenuation behaviour (change in attenuation) when an optical fibre cable with cable elements fixed at both ends is subjected to temperature cycling. This test assesses the attenuation behaviour of a cable under a no-end movement condition intended for termination with, for example, interconnecting devices or passive components.

NOTE IEC 60794-1-201¹ (method F1) is a general temperature cycling test for 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 60793-1-46, *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>

¹ Under preparation. Stage at the time of publication: IEC FDIS 60794-1-201:2024.

4 Method F12 – Temperature cycling with cable elements fixed at both ends

4.1 Sample

The sample shall be taken from a finished cable length. The sample length shall be longer than the device under test (DUT) to allow for connection to the optical measurement device outside the temperature chamber and, if necessary, to have sufficient length to permit optical measurements, as shown in Figure 1. The length of DUT shall be as specified in the relevant specification. If the length of DUT is not specified, then a length of 10 m should be used.

4.2 Apparatus

The apparatus shall consist of the following:

- a) a temperature chamber suitable to accommodate the DUT and to maintain the specified temperature within ± 3 °C;
- b) attenuation monitoring equipment according to IEC 60793-1-46.

NOTE One example of a suitable chamber is given in IEC 60068-2-14:2009, Clause 8.

4.3 Procedure

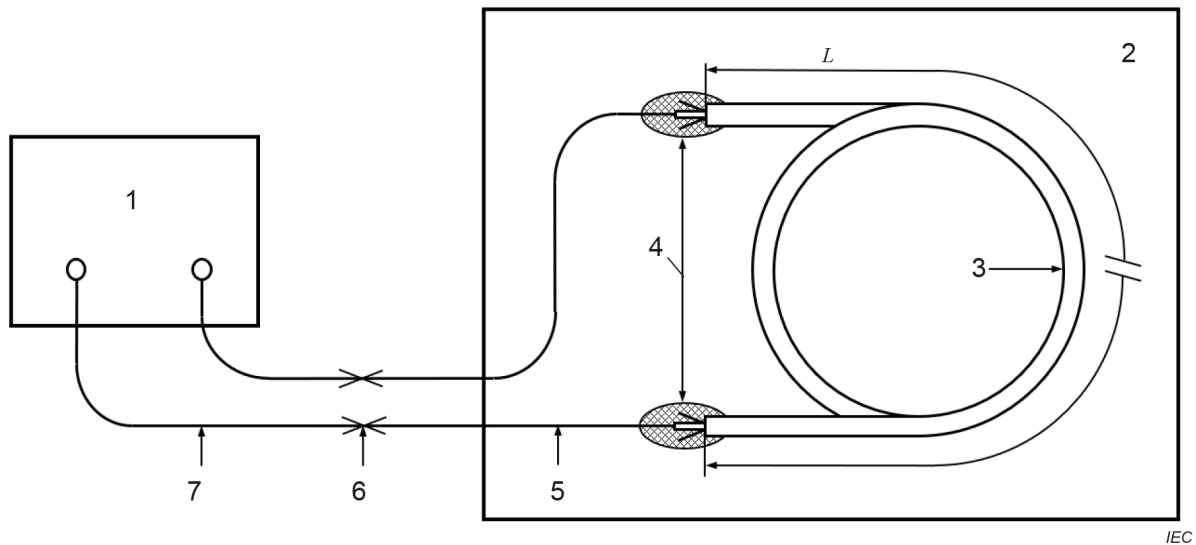
4.3.1 Preparation of cable sample and DUT

The cable sample length shall be longer than the length of the DUT to allow for connection to the optical measurement device outside the temperature chamber and, if necessary, to have sufficient length to permit optical measurements. The DUT shall be coiled with a diameter larger than the minimum bending diameter specified for the cable in service. At both ends of the length of the DUT, all components of the cable shall be fixed together to avoid any relative movement between the cable elements at the fixing point, as shown in Figure 1. All cable elements (for example simplex cable) or at the individual cable units (for example simplex cable units within a breakout cable) at both ends of the DUT where for example connectors or passive components are intended to be terminated shall be fixed together. The fixing can be done, for example, by clamping or adhesive bonding. Such fixing shall not affect the attenuation of the test sample.

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4.3.2 Preparation of test

The DUT shall be placed in the temperature chamber, as shown in Figure 1, with a method of storage that shall not affect the optical fibre with respect to expansion or contraction. The optical fibre ends (outside the chamber) of the cable sample can be temporarily joint to pigtails. The deployment of the cable sample outside the chamber shall not affect the results.



Key

- 1 attenuation measurement device
- 2 temperature chamber
- 3 DUT, example shown of a simplex cable
- 4 all cable elements fixed at the ends of DUT
- 5 optical fibre of cable sample including the DUT
- 6 fibre connection (for example splice)
- 7 optical fibre
- L length of DUT

Figure 1 – Preparation of the cable sample, DUT and test set-up

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4.3.3 Preconditioning

The cable sample shall be preconditioned at standard atmospheric conditions as defined in IEC 60794-1-2.

4.3.4 Temperature cycling

The temperature in the temperature chamber shall be at ambient temperature. Throughout this procedure, the ambient temperature condition is the standard test condition as defined in IEC 60794-1-2. The temperature cycles shall be carried out as shown in Figure 2 and as follows:

- 1) the temperature of the chamber shall be decreased to the low temperature T_{A2} at a rate of cooling not to exceed 60 °C/h;
- 2) as soon as the temperature in the chamber has reached stable condition, the DUT shall be exposed to the low temperature for the appropriate period t_1 (see next bullet point);
- 3) a minimum soak time is given in Table 1; however, the soak time, t_1 , shall be sufficient to bring the DUT to equilibrium with the specified temperature;
- 4) the temperature in the chamber is then increased to the high temperature T_{B2} at a rate of heating not to exceed 60 °C/h;
- 5) as soon as the temperature in the chamber has reached stable condition, the DUT shall be exposed to the high temperature for the appropriate period t_1 ;
- 6) the temperature in the chamber shall be decreased to ambient temperature at a rate of cooling not to exceed 60 °C/h.