IEC 60794-1-24

Edition 1.0 2014-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Optical fibre cables – Part 1-24: Generic specification – Basic optical cable test procedures – Electrical test methods

Câbles à fibres optiques – Partie 1-24: Spécification générique – Méthodes fondamentales d'essais applicables aux câbles optiques – Méthodes d'essais électriques

IEC 60794-1-24:2014-05(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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OPTICAL FIBRE CABLES –

Part 1-24: Generic specification – Basic optical cable test procedures – Electrical test methods

FOREWORD

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International Standard IEC 60794-1-24 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This edition of IEC 60794-1-24 cancels and replaces the electrical tests methods section of the second edition of IEC 60794-1-2, published in 2003 (and subsequently replaced by the third edition). 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 : Cross reference table
– IEC 60794-1-20 : General and definitions
– IEC 60794-1-21 : Mechanical tests
– IEC 60794-1-22 : Environmental tests

– IEC 60794-1-23 : Cable elements
– IEC 60794-1-24 : Electrical tests

This bilingual version (2015-12) corresponds to the monolingual English version, published in 2014-05.

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

FDIS	Report on voting
86A/1591/FDIS	86A/1606/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.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the 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- withdrawn,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 1-24: Generic specification – Basic optical cable test procedures – Electrical test methods

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.

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

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

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.

Void.

3 Method H1: Short-circuit test (for OPGW and OPAC)

3.1 Object

The short-circuit test is intended to assess the performance of the OPGW (optical ground wire) under typical short-circuit, or the impact on the performance of OPAC (optical attached cable) under short-circuit current on the messenger wire.

3.2 Sample

3.2.1 OPGW testing

3.2.1.1 Two samples test method

A typical arrangement using two test samples is shown in Figure 1.

Two samples, each being at least 10 m long, shall be terminated at each end with suitable fittings. In sample A, one or more thermocouples shall be inserted into holes drilled into the optical unit to monitor the optical unit temperature. In sample B, one or more thermocouples shall be attached to the wires of the OPGW to monitor the OPGW temperature. Fibre optical attenuation shall be measured using a light source and power meter connected to each end of the test fibre of sample B. The test length of the optical fibre shall be a minimum of 100 m (when the sample is shorter than 100 m, concatenation shall be used) .

3.2.1.2 One sample test method

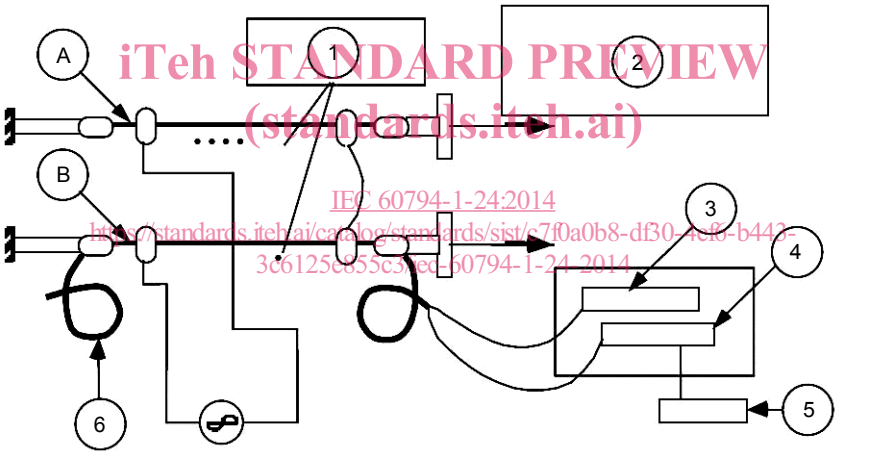
The sample, at least 10 m long, shall be terminated at each end with suitable fittings. One or more thermocouples shall be inserted through the strands of the OPGW onto the surface of the optical unit to monitor the optical unit temperature. One or more thermocouples shall be attached to the wires of the OPGW to monitor the OPGW temperature. Fibre optical attenuation shall be measured using a light source and power meter connected to each end of the test fibre. The test length of the optical fibre shall be a minimum of 100 m. (when the sample is shorter than 100 m, concatenation shall be used).

3.2.2 OPAC testing

A typical arrangement for testing OPAC is shown in Figure 2.

The OPAC test sample, at least 10 m long, is attached to the agreed messenger wire with suitable fittings. Thermocouples shall be attached to the messenger wire to record the temperature achieved during the test. In addition, a light source and power meter shall be connected to each end of the test fibre in the OPAC to measure the relative attenuation level. The test length of optical fibre shall be a minimum of 100 m (when the sample is shorter than 100 m, concatenation shall be used).

3.3 Apparatus

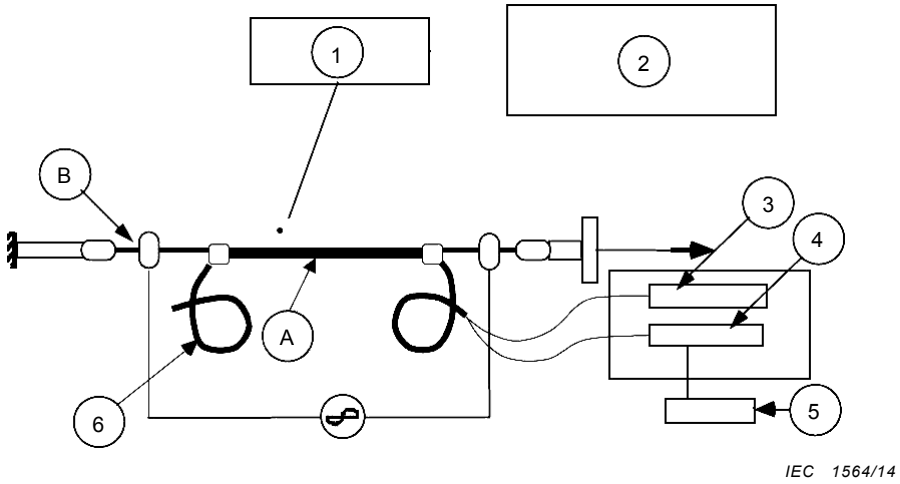


Key

1 thermocouples
- armour temperature is measured
- optical core temperature is measured

2 thermocouple recorder
3 light source
4 power meter
5 recorder
6 fibre looped
A, B test samples

Figure 1 – OPGW short-circuit test arrangement



Key
1 thermocouple
- messenger temperature is measured
2 thermocouple recorder
3 light source
4 power meter
5 recorder
6 fibre looped
A attached cable
B messenger

Figure 2 – OPAC short-circuit test arrangement

3.4 Procedure

3.4.1 OPGW testing

The general test conditions are as follows:

– Tensile load: 15 % ± 5 % of RTS (rated tensile strength)
– Sample length: > 10 m
– Fibre test length: > 100 m
– Initial sample temperature: as agreed between customer and supplier
– Fault current intensity: as agreed between customer and supplier
– Fault current duration: as agreed between customer and supplier
– Number of pulses: 3 minimum
– Waveform: to be symmetrical after the 3rd cycle

The current pulses shall be applied with the metallic cables being allowed to cool down to within 5 °C of the initial temperature between each pulse.

Optical attenuation of the test fibres shall be monitored continuously for at least 2 min before, until at least 5 min after each current pulse.

The temperature of the OPGW and the optical unit shall be monitored.

3.4.2 OPAC testing

The general test conditions are as follows:

– Tensile load: agreed between customer and supplier
– Sample length: > 10 m
– Fibre test length:> 100 m
– Initial sample temperature: as agreed between customer and supplier
– Messenger maximum temperature: refer to the detail specification

– Fault current duration: refer to customer specification
– Number of pulses: 3 minimum
– Waveform: to be symmetrical after the 3rd cycle

The initial messenger wire temperature shall be mutually agreed between the customer and the supplier. The current pulses shall be applied with the messenger wire being allowed to cool down to within 5 °C of the initial temperature between each pulse.

Optical attenuation of the test fibres shall be monitored continuously fromr at least 2 min before, until at least 5 min after each current pulse. The temperature of the messenger wire shall also be monitored.

3.4.3 Common procedure for OPGW and OPAC

The OPGW and OPAC shall be dismantled after the short-circuit current test. Each component of the cable shall be separated and inspected for excessive wear, discoloration, deformation or signs of breakdown. Attention should be made to the sections of the cable nearest to the terminating hardware and at mid-point of the span.

3.5 Requirements

The acceptance criteria for the test shall be as stated in the detail specification.

On completion, the maximum temperature reached by any component in the OPGW shall be within the allowed temperature range specified by the supplier for this component.

During the test the messenger wire that the OPAC is attached to should attain the temperature lower that the maximum specified by the customer.

Excessive wear, discoloration, deformation or breakdown shall not be observed by the inspection after the exposure to the current pulse.

3.6 Details to be specified

3.6.1 OPGW testing

– Procedure used (one sample or two samples test method)
– Initial sample temperature
– Fault current intensity
– Fault current duration
– Number of pulses

3.6.2 OPAC testing

– Messenger tensile load
– Initial sample temperature
– Maximum temperature to be reached by the messenger wire
– Fault current duration
– Number of pulses

4 Method H2: Lightning test method for optical aerial cables along electric power lines (OPGW and OPAC)

4.1 Object

This test is intended to evaluate the impact of a lightning strike on an OPGW or OPAC.

4.2 General

Lightning test should be carried out only for comparison between different OPGW designs.

In the case of OPAC cables, the cable shall be installed on the messenger so as to simulate as closely as possible a real installation, and the lightning test should be carried out to determine that the sheath is not severely damaged.

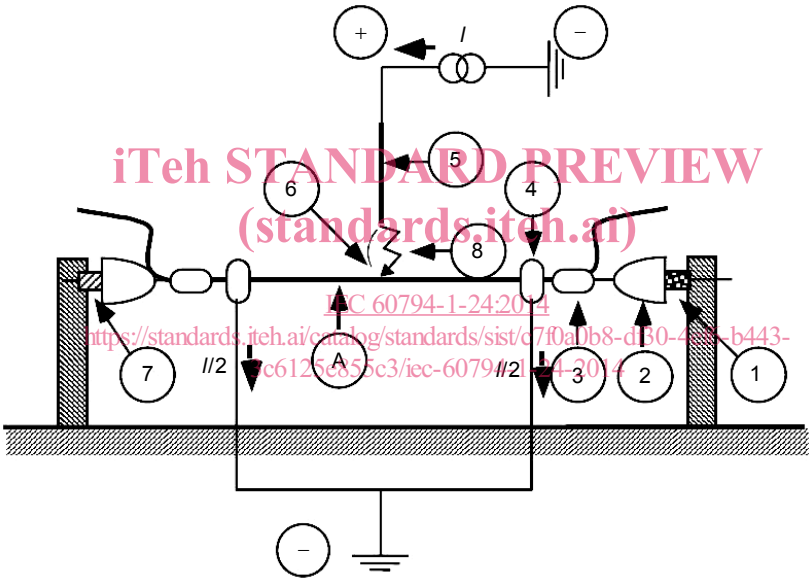
4.3 Sample

The test shall be performed on the mid-point of an OPGW sample or an OPAC sample attached to the agreed messenger.

The sample shall be at least 1 m long between the anchoring clamps.

4.4 Apparatus

A typical test arrangement which can be used for the lightning test is shown in Figure 3.



Key

1 thermocouple
2 insulator
3 anchoring clamps
4 symmetric earthing connectors
5 electrode with plane surface preferring Wolfram-Copper
6 metal fuse for ignition
7 tension meter
8 gap between electrode and cable surface = 6 cm

A test sample (including OPAC messenger wire)

Figure 3 – Lightning test arrangement

The electrode, consisting of a copper or iron rod, shall be positioned above the metallic cable. The electrode and metallic cable shall be connected between themselves by metal fuse. The applied tensile load on the metallic cable sample shall be EDS (every day stress), 15 % to 25 % of the RTS (rated tensile stress). If mutually agreed between the customer and supplier, other tension loads may be applied.

When testing an OPAC, a metal fuse shall be connected as closely as possible to a point where the OPAC and, where applicable, the lashing binder is in contact with the messenger.