

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Optical fibre cables –
Part 1-401: Generic specification – Basic optical cable test procedures –
Electrical test methods – Short-circuit test (for OPGW, OPPC and OPAC),
Method H1**

**Câbles à fibres optiques –
Partie 1-401: Spécification générique – Procédures fondamentales d'essais des
câbles optiques – Méthodes d'essais électriques – Essai de court-circuit (pour
les OPGW, les OPPC et les OPAC), Méthode H1**



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IEC Secretariat
3, rue de Varembe
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 1-401: Generic specification – Basic optical cable
test procedures – Electrical test methods –
Short-circuit test (for OPGW, OPPC and OPAC), Method H1**

FOREWORD

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IEC 60794-1-401 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is an International Standard.

This first edition cancels and replaces the first edition of IEC 60794-1-24 published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) OPPC is included;
- b) the test methods have been updated.

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

Draft	Report on voting
86A/2044/CDV	86A/2127/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/standardsdev/publications.

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 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

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- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The electrical tests contained in IEC 60794-1-24:2014 will now be individually numbered in the IEC 60794-1-4xx 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 1-401: Generic specification – Basic optical cable test procedures – Electrical test methods – Short-circuit test (for OPGW, OPPC and OPAC), Method H1

1 Scope

This part of IEC 60794 applies to the short-circuit test intended to assess the performance of an optical ground wire (OPGW) or optical phase conductor (OPPC) under typical short-circuit, or the impact on the performance of optical attached cable (OPAC) under short-circuit current on the messenger wire.

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*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the definitions given in IEC 60794-1-1 apply.

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>

3.2 Abbreviated terms

OPAC	optical attached cable
OPGW	optical ground wire
OPPC	optical phase conductor
RTS	rated tensile strength

4 Sample

4.1 OPGW and OPPC testing

4.1.1 Two samples test method

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

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 OPGW/OPPC to monitor the locations where OPGW/OPPC maximum temperature is expected (i.e. between ACS wires, or between ACS and aluminium alloy wires). The optical attenuation of the monitored fibres shall be measured according to IEC 60793-1-46. The test length of the optical fibre shall be longer than 100 m. The test loop shall preferably include at least 24 fibres (fibre concatenation shall be used), or all the fibres in the cable when the fibre count is lower. If the OPGW/OPPC under test comprises multiple units (tubes) with optical fibres, the measured fibres shall be taken from all units in equal numbers.

4.1.2 One sample test method

A typical arrangement using one test sample is shown in Figure 1b).

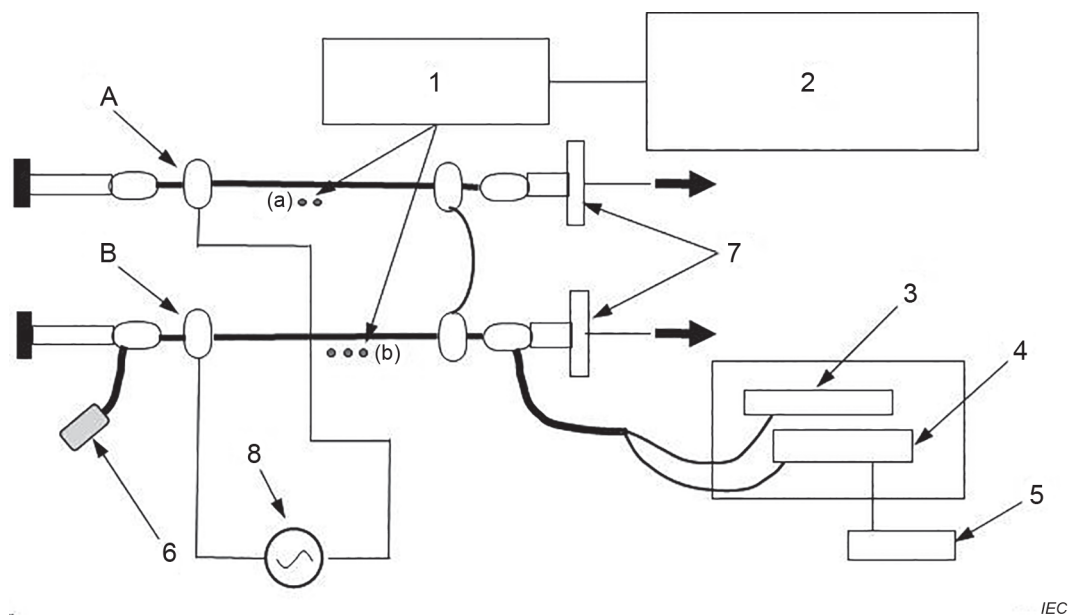
The sample, at least 10 m long, shall be terminated at each end with suitable fittings. One or more thermocouples shall be inserted through the strands of the OPGW/OPPC onto the surface of the optical unit to monitor the optical unit temperature. One or more thermocouples shall be attached to the wires of the OPGW/OPPC to monitor the OPGW/OPPC temperature. The optical attenuation of the monitored fibres shall be measured according to IEC 60793-1-46. The test length of the optical fibre shall be longer than 100 m. The test loop shall preferably include at least 24 fibres (fibre concatenation shall be used), or all fibres in the cable when the fibre count is lower. If the OPGW/OPPC under test comprises multiple units (tubes) with optical fibres, the measured fibres shall be taken from all units in equal numbers.

4.2 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 messenger wire with suitable fittings according to the arrangement used in service (the messenger wire used and the type of attachment, such as tight side by side or twine with a certain pitch, shall be specified in the particular conditions). One or more thermocouples shall be attached to the messenger wire to record the temperature achieved during the test. The optical attenuation of the monitored fibres shall be measured according to IEC 60793-1-46. The test length of optical fibre shall be longer than 100 m. The test loop shall preferably include at least 24 fibres (fibre concatenation shall be used), or all fibres in the cable when the fibre count is lower. If the OPAC under test comprises multiple units (tubes) with optical fibres, the measured fibres shall be taken from all units in equal numbers.

5 Apparatus



Key

1 thermocouples

- armour temperature is measured (b)
- optical core surface temperature is measured (a)

2 thermocouple recorder

3 light source

4 power meter

5 recorder

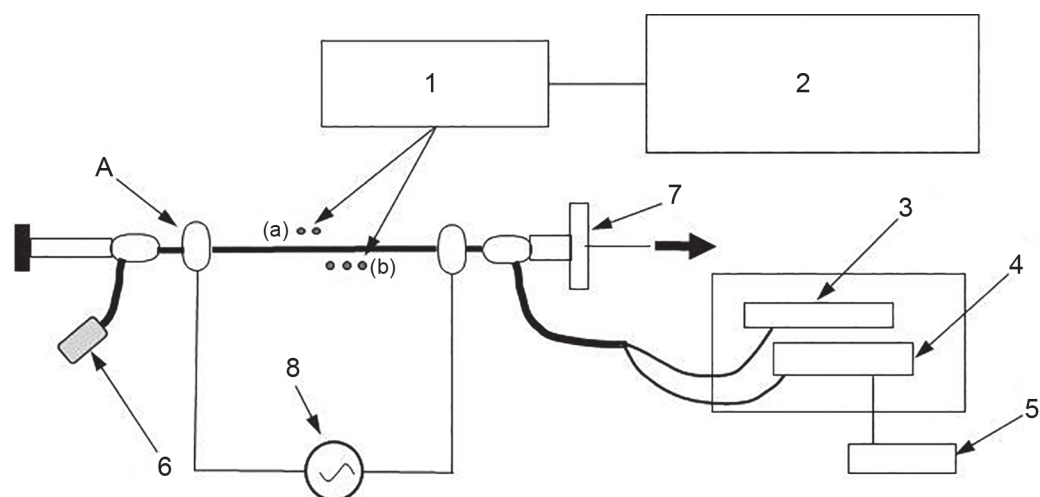
6 fibre looped

7 mechanical load system

8 AC current source

A, B test samples

a) two samples test arrangement



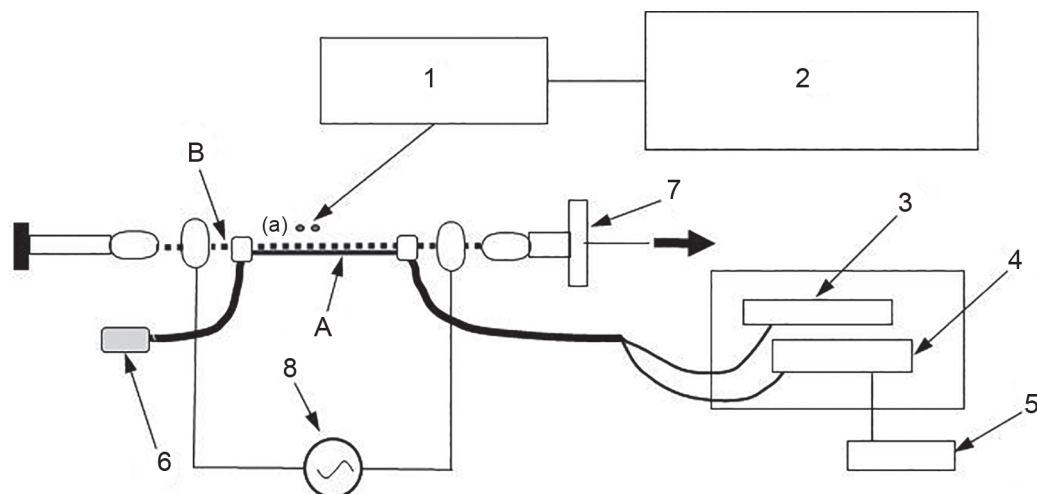
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Key

- 1 thermocouples
 - armour temperature is measured (b)
 - optical core surface temperature is measured (a)
- 2 thermocouple recorder
- 3 light source
- 4 power meter
- 5 recorder
- 6 fibre looped
- 7 mechanical load system
- 8 AC current source
- A test sample

b) one sample test arrangement

Figure 1 – OPGW/OPPC short-circuit test arrangement



IEC

Key

- 1 thermocouple
- messenger temperature is measured
- 2 thermocouple recorder
- 3 light source
- 4 power meter
- 5 recorder
- 6 fibre looped
- 7 mechanical load system
- 8 AC current source
- A OPAC cable under test (solid line)
- B messenger (dotted line)

Figure 2 – OPAC short-circuit test arrangement

6 Procedure

6.1 OPGW testing

The general test conditions are as follows:

- tensile load: 15 % to 20 % of rated tensile strength (RTS)
- sample length: ≥ 10 m
- fibre test length: > 100 m
- 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 initial sample temperature shall be $40\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, if not otherwise agreed between customer and manufacturer.