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Edition 3.1 2021-12
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Fibre-optic communication subsystem test procedures – Part 4-1: Installed cabling plant – Multimode attenuation measurement

Procédures d'essai des sous-systèmes de télécommunication fibroniques – Partie 4-1: Installation câblée – Mesure de l'affaiblissement en multimodal

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE-OPTIC COMMUNICATION SUBSYSTEM TEST PROCEDURES –

Part 4-1: Installed cabling plant – Multimode attenuation measurement

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 61280-4-1 edition 3.1 contains the third edition (2019-05) [documents 86C/1575/FDIS and 86C/1592/RVD], its corrigenda 1 (2020-04) and 2 (2022-12), and its amendment 1 (2021-12) [documents 86C/1720/CDV and 86C/1592/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61280-4-1 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This third edition constitutes a technical revision.

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

a) changes to Annex F on encircled flux to harmonise with IEC TR 62614-2, but keeping the encircled flux limits defined in Tables F.2 to F.5 unchanged;
b) addition of an equipment cord method in Annex D;
c) inclusion of testing bend insensitive multimode optical fibre;
d) updates to measurement uncertainty;
e) definition of additional cabling configurations;
f) changes to Table 5 on spectral requirements.

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

A list of all parts in the IEC 61280 series, published under the general title *Fibre optic communication subsystem test procedures*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under webstore.iec.ch in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
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FIBRE-OPTIC COMMUNICATION SUBSYSTEM TEST PROCEDURES –

Part 4-1: Installed cabling plant – Multimode attenuation measurement

1 Scope

This part of IEC 61280 is applicable to the measurement of attenuation of installed optical fibre cabling plant using multimode optical fibre. This cabling plant can include multimode optical fibres, connectors, adapters, splices, and other passive devices. The cabling can be installed in a variety of environments including residential, commercial, industrial, and data centre premises, as well as outside plant environments. The test equipment used in this document has one single fibre connector interface or two single fibre connector interfaces.

In this document, the optical fibres that are addressed include sub-categories A1-OMx, where x = 2, 3, 4 and 5 (50/125 µm) and A1-OM1 (62,5/125 µm) multimode optical fibres, as specified in IEC 60793-2-10. The attenuation measurements of the other multimode categories can be made using the approaches of this document, but the source conditions for the other categories have not been defined.

2 Normative references

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IEC 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*

IEC 61280-1-3, *Fibre optic communication subsystem test procedures – Part 1-3: General communication subsystems – Central wavelength and spectral width measurement*

IEC 61280-1-4, *Fibre optic communication subsystem test procedures – Part 1-4: General communication subsystems – Light source encircled flux measurement method*

IEC 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – Visual inspection of fibre optic connectors and fibre-stub transceivers*

IEC 61315, *Calibration of fibre-optic power meters*

IEC 61746-2, *Calibration of optical time-domain reflectometers (OTDR) – Part 2: OTDR for multimode fibres*

3 Terms, definitions, graphical symbols and abbreviated terms

For the purposes of this document, the following terms, definitions, graphical symbols and abbreviated terms 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

3.1 Terms and definitions

3.1.1
attenuation
A
reduction of optical power induced by transmission through a medium such as cabling

$$A = 10 \log(P_{in}/P_{out})$$

where

P_{in} and P_{out} are the power, typically measured in mW, into and out of the cabling

Note 1 to entry: Attenuation is expressed in dB.

3.1.2
light source power meter
LSPM
test system consisting of a light source (LS) and power meter (PM) used to measure the attenuation of installed cabling plant

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3.1.3
optical time domain reflectometer
OTDR
test system consisting of an optical time-domain reflectometer instrument used to characterize and measure the attenuation of installed cabling plant and specific elements within that cabling plant

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Note 1 to entry: This note applies to the French language only.

3.1.4
test cord
terminated optical fibre cord used to connect the optical source or detector to the cabling, or to provide suitable interfaces to the cabling under test

Note 1 to entry: There are five types of test cords:

– launch cord: used to connect the light source to the cabling;
– receive cord: used to connect the cabling to the power meter (LSPM only);
– tail cord: attached to the far end of the cabling when an OTDR is used at the near end. This provides a means of evaluating attenuation of the whole of the cabling including the far end connection;
– adapter cord: used to transition between sockets or other incompatible connectors in a required test configuration;
– substitution cord: a test cord used within a reference measurement which is replaced during the measurement of the attenuation of the cabling under test.

3.1.5
bi-directional measurement
two measurements of the same optical fibre, made by launching light into opposite ends of that fibre

3.1.6
configuration
form or arrangements of parts or elements such as terminations, connections and splices

3.1.7
encircled flux
EF
fraction of cumulative near-field power to the total output power as a function of radial distance from the optical centre of the core

[SOURCE: IEC 62614:2010, 3.2]

3.1.8
reference-grade termination
connector and plug with tightened tolerances terminated onto an optical fibre with tightened tolerances such that the expected attenuation of a connection formed by mating two such assemblies is lower and more repeatable than a standard-grade termination

Note 1 to entry: An adapter, required to assure the reduced attenuation, may be considered as part of the reference-grade termination where required by the test configuration.

Note 2 to entry: IEC 61755-6-2 defines reference-grade terminations for 50/125 µm fibre.

3.1.9
connector
component normally attached to an optical cable or piece of apparatus for the purpose of providing frequent optical interconnection/disconnection of optical fibres or cables

[SOURCE: IEC TR 61931:1998, 2.6.1, modified – The words in brackets, "optical" and "fibre", have been omitted from the term.]

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3.1.10
plug
male-type part of a connector

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[SOURCE: IEC TR 61931:1998, 2.6.2]

3.1.11
adapter
female-type part of a connector in which one or two plugs are inserted and aligned

[SOURCE: IEC TR 61931:1998, 2.6.4]

3.1.12
socket-style connector
connector for which the adapter, including any alignment device, is integrated with and permanently attached to the connector plug on one side of the connection

Note 1 to entry: Examples include many harsh environment connectors.

3.1.13
reference test method
RTM
test method for measuring a given characteristic strictly according to the definition of this characteristic, and giving results which are accurate, reproducible and relatable to practical use

Note 1 to entry: This note applies to the French language only.

[SOURCE: IEC TR 61931:1998, 2.8.1, modified – The words in brackets, "for optical fibres", have been omitted from the term.]