SLOVENSKI STANDARD
SIST EN 61746-2:2011

01-marec-2011

Kalibriranje optičnih reflektometrov v časovnem prostoru (OTDR) - 2. del: OTDR za večrodovna vlakna (IEC 61746-2:2010)

Calibration of Optical Time-Domain Reflectometers (OTDR) - Part 2: OTDR for multimode fibres (IEC 61746-2:2010)

Kalibrierung optischer Rückstreumessgeräte (OTDR) - Teil 2: OTDR für Mehrmodenfasern (IEC 61746-2:2010)

Etalonnage des réflectomètres optiques dans le domaine de temps (OTDR) - Partie 2: OTDR pour les fibres multimodes (CEI 61746-2:2010)

Ta slovenski standard je istoveten z: **EN 61746-2:2011**

ICS:

17.180.30	Optični merilni instrumenti	Optical measuring instruments
33.180.99	Druga oprema za optična vlakna	Other fibre optic equipment

SIST EN 61746-2:2011 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61746-2

January 2011

ICS 33.180.01

Supersedes EN 61746:2005 (partially)

English version

Calibration of optical time-domain reflectometers (OTDR) - Part 2: OTDR for multimode fibres

(IEC 61746-2:2010)

Etalonnage des réflectomètres optiques dans le domaine de temps (OTDR) - Partie 2: OTDR pour les fibres multimodes (CEI 61746-2:2010)

Kalibrierung optischer Rückstreumessgeräte (OTDR) - Teil 2: OTDR für Mehrmodenfasern (IEC 61746-2:2010)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 61746-2:2011 E

Foreword

The text of document 86/336/CDV, future edition 1 of IEC 61746-2, prepared by IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61746-2 on 2011-01-02.

This European Standard partially supersedes EN 61746:2005.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2011-10-02
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-01-02

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61746-2:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

[2] IEC 60793-1-1	NOTE	Harmonized as EN 60793-1-1.
[3] IEC 60793-1-40	NOTE	Harmonized as EN 60793-1-40.
[4] IEC 60794-1-2	NOTE	Harmonized as EN 60794-1-2.
[5] IEC 60825-1	NOTE	Harmonized as EN 60825-1.
[6] IEC 60825-2	NOTE	Harmonized as EN 60825-2.
[7] IEC 61280-1-3	NOTE	Harmonized as EN 61280-1-3.
[8] IEC 61280-2-10	NOTE	Harmonized as EN 61280-2-10.
[9] IEC 61300-3-6	NOTE	Harmonized as EN 61300-3-6.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60793-2-10	-	Optical fibres - Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres	EN 60793-2-10	-
IEC 60793-2-50	-	Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres	EN 60793-2-50	-
IEC 61280-1-4	-	Fibre optic communication subsystem test procedures - Part 1-4: General communication subsystems - Light source encircled flux measurement method	EN 61280-1-4	-
IEC 61280-4-1	-	Fibre optic communication subsystem test procedures - Part 4-1: Installed cable plant - Multimode attenuation measurement	EN 61280-4-1	-
IEC 61745	-	End-face image analysis procedure for the calibration of optical fibre geometry test sets	-	-
ISO/IEC 17025	-	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	-

IEC 61746-2

Edition 1.0 2010-06

INTERNATIONAL STANDARD

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE X

ICS 33.180.01

ISBN 978-2-88912-026-0

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CALIBRATION OF OPTICAL TIME-DOMAIN REFLECTOMETERS (OTDR) –

Part 2: OTDR for multimode fibres

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61746-2 has been prepared by IEC technical committee 86: Fibre optics.

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

CDV	Report on voting
86/336/CDV	86/359/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

A list of all parts of IEC 61746 series, under the general title *Calibration of optical time-domain reflectometers (OTDR)*, 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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

In order for an optical time-domain reflectometer (OTDR) to qualify as a candidate for complete calibration using this standard, it must be equipped with the following minimum feature set:

a) the ability to measure type A1a or A1b IEC 60793-2-10 fibres;

b) a programmable index of refraction, or equivalent parameter;

c) the ability to present a display of a trace representation, with a logarithmic power scale and a linear distance scale;

d) two markers/cursors, which display the loss and distance between any two points on a trace display;

e) the ability to measure absolute distance (location) from the OTDR's zero-distance reference;

f) the ability to measure the displayed power level relative to a reference level (for example, the clipping level).

Calibration methods described in this standard may look similar to those provided in Part 1 of this series. However, there are differences: mix of different fibre types, use of mode conditioner or different arrangement of the fibres. This leads to different calibration processes as well as different uncertainties analysis.

CALIBRATION OF OPTICAL TIME-DOMAIN REFLECTOMETERS (OTDR) –

Part 2: OTDR for multimode fibres

1 Scope

This part of IEC 61746 provides procedures for calibrating multimode optical time domain reflectometers (OTDR). It covers OTDR measurement errors and uncertainties. The test of the laser(s) source modal condition is included as an optional measurement.

This standard does not cover correction of the OTDR response.

2 Normative references

The following referenced documents are indispensable for the application 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 60793-2-10, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

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

IEC 61280-4-1, *Fibre optic communication subsystem test procedures – Part 4-1: Installed cable plant – Multimode attenuation measurement*

IEC 61745, *End-face image analysis procedure for the calibration of optical fibre geometry test sets*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms, definitions and symbols

For the purposes of this document, the following terms, definitions and symbols apply.

NOTE For more precise definitions, the references to IEC 60050-731 should be consulted.

3.1
attenuation
A
loss

optical power decrease in decibels (dB)

NOTE If P_{in} (watts) is the power entering one end of a segment of fibre and P_{out} (watts) is the power leaving the other end, then the attenuation of the segment is

$$A = 10\log_{10}\left(\frac{P_{in}}{P_{out}}\right) \text{ dB} \quad (1)$$

[IEV 731-01-48, modified]

3.2
attenuation coefficient
α
attenuation (3.1) of a fibre per unit length

[IEV 731-03-42, modified]

3.3
attenuation dead zone
for a reflective or attenuating event, the region after the event where the displayed trace deviates from the undisturbed backscatter trace by more than a given vertical distance ΔF

NOTE The attenuation dead zone (see Figure 1 below) will depend on the following event parameters: reflectance, loss, displayed power level and location. It may also depend on any fibre optic component in front of the event.

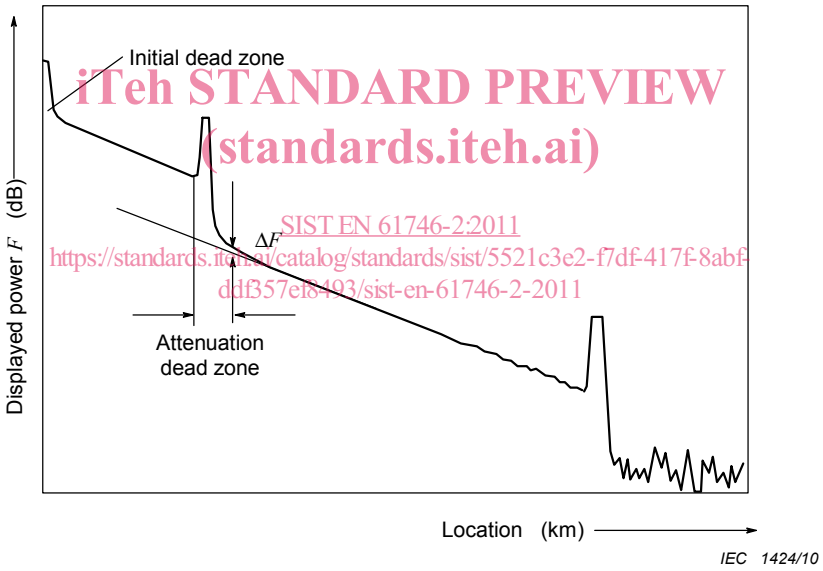

Figure 1 – Definition of attenuation dead zone

3.4
calibration
set of operations which establish, under specified conditions, the relationship between the values indicated by the measuring instrument and the corresponding known values of that quantity

NOTE See ISO *Guide International vocabulary of basic and general terms in metrology*.

3.5
centroidal wavelength
λ_{avg}
power-weighted mean wavelength of a light source in vacuum

[IEC 61280-1-3, definition 2.1.4]

3.6
displayed power level
F
level displayed on the OTDR's power scale

NOTE 1 Unless otherwise specified, F is defined in relation to the clipping level (see Figure 8).

NOTE 2 Usually, the OTDR power scale displays five times the logarithm of the received power, plus a constant offset.

3.7
distance
D
spacing between two features

NOTE Usually expressed in metres.

3.8
distance sampling error
$\Delta L_{\mathbf{sample}}$
maximum distance (3.7) error attributable to the distance between successive sample points

NOTE 1 Usually expressed in metres.

NOTE 2 The distance sampling error is repetitive in nature; therefore, one way of quantifying this error is by its amplitude.

3.9
distance scale deviation
$\Delta S_{\mathbf{L}}$
difference between the average displayed distance (3.7) $< D_{\mathrm{otdr}} >$ and the correspondent reference distance (3.27) D_{ref} divided by the reference distance (3.27)

NOTE 1 Usually expressed in m/m.

NOTE 2 ΔS_{L} is given by the following formula

$$\Delta S_{\mathrm{L}} = \frac{< D_{\mathrm{otdr}} > - D_{\mathrm{ref}}}{D_{\mathrm{ref}}} = \frac{< D_{\mathrm{otdr}} >}{D_{\mathrm{ref}}} - 1 \qquad (2)$$

where $< D_{\mathrm{otdr}} >$ is the displayed distance on a fibre averaged over at least one sample spacing.

3.10
distance scale factor
$S_{\mathbf{L}}$
average displayed distance (3.7) divided by the correspondent reference distance (3.27)

NOTE 1 S_{L} is given by the following formula

$$S_L = \frac{< D_{\mathrm{otdr}} >}{D_{\mathrm{ref}}} \qquad (3)$$

where $< D_{\mathrm{otdr}} >$ is the displayed distance between two features on a fibre (actual or simulated) averaged over at least one sample spacing.

3.11
distance scale uncertainty
$u_{\mathbf{\Delta SL}}$
uncertainty of the distance scale deviation (3.9)

NOTE 1 Usually expressed in m/m.