Irish Standard
I.S. EN 60793-1-41:2010

Optical fibres -- Part 1-41: Measurement methods and test procedures - Bandwidth (IEC 60793-1 -41:2010 (EQV))

I.S. EN 60793-1-41:2010

Incorporating amendments/corrigenda issued since publication:

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EUROPEAN STANDARD

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EN 60793-1-41

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Supersedes EN 60793-1-41:2003

English version

Optical fibres - Part 1-41: Measurement methods and test procedures - Bandwidth

(IEC 60793-1-41:2010)

Fibres optiques -
Partie 1-41: Méthodes de mesure
et procédures d'essai -
Largeur de bande
(CEI 60793-1-41:2010)

Lichtwellenleiter -
Teil 1-41: Messmethoden
und Prüfverfahren -
Bandbreite
(IEC 60793-1-41:2010)

This European Standard was approved by CENELEC on 2010-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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 60793-1-41:2010 E

Foreword

The text of document 86A/1294/CDV, future edition 3 of IEC 60793-1-41, prepared by SC 86A, Fibres and cables, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60793-1-41 on 2010-10-01.

This European Standard supersedes EN 60793-1-41:2003.

The main change with respect to EN 60793-1-41:2003 is the addition of a third method for determining modal bandwidth based on DMD data and to improve measurement procedures for A4 fibres.

This standard should be read in conjunction with EN 60793-1-1 and IEC 60793-1-2, which cover generic specifications.

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)	2011-07-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2013-10-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 60793-1-41:2010 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:

[1] IEC 60793-2-10	NOTE	Harmonized as EN 60793-2-10.
[2] IEC 60793-2-30	NOTE	Harmonized as EN 60793-2-30.
[3] IEC 60793-2-40	NOTE	Harmonized as EN 60793-2-40.

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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 60793-1-20	-	Optical fibres - Part 1-20: Measurement methods and test procedures - Fibre geometry	EN 60793-1-20	-
IEC 60793-1-42	-	Optical fibres - Part 1-42: Measurement methods and test procedures - Chromatic dispersion	EN 60793-1-42	-
IEC 60793-1-43	-	Optical fibres - Part 1-43: Measurement methods and test procedures - Numerical aperture	EN 60793-1-43	-
IEC 60793-1-49	2006	Optical fibres - Part 1-49: Measurement methods and test procedures - Differential mode delay	EN 60793-1-49	2006

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRES –

Part 1-41: Measurement methods and test procedures – Bandwidth

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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9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60793-1-41 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition published in 2003. This edition constitutes a technical revision.

The main change with respect to the previous edition is the addition of a third method for determining modal bandwidth based on DMD data and to improve measurement procedures for A4 fibres.

This standard should be read in conjunction with IEC 60793-1-1 and IEC 60793-1-2, which cover generic specifications.

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

FDIS	Report on voting
86A/1294/CDV	86A/1329/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.

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

A list of all parts of the IEC 60793-1-4x series, published under the general title *Optical fibres – measurement methods and test procedures*, 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

OPTICAL FIBRES –

Part 1-41: Measurement methods and test procedures – Bandwidth

1 Scope

This part of IEC 60793 describes three methods for determining and measuring the modal bandwidth of multimode optical fibres (see IEC 60793-2-10, IEC 60793-30 series and IEC 60793-40 series). The baseband frequency response is directly measured in the frequency domain by determining the fibre response to a sinusoidaly modulated light source. The baseband response can also be measured by observing the broadening of a narrow pulse of light. The calculated response is determined using differential mode delay (DMD) data. The three methods are:

- Method A – Time domain (pulse distortion) measurement
- Method B – Frequency-domain measurement
- Method C – Overfilled launch modal bandwidth calculated from differential mode delay (OMBc)

Methods A and B can be performed using one of two launches: an overfilled launch (OFL) condition or a restricted mode launch (RML) condition. Method C is only defined for A1a.2 (and A1a.3 in preparation) multimode fibre and uses a weighted summation of DMD launch responses with the weights corresponding to an overfilled launch condition. The relevant test method and launch condition should be chosen according to the type of fibre.

NOTE 1 These test methods are commonly used in production and research facilities and are not easily accomplished in the field.

NOTE 2 OFL has been used for the modal bandwidth value for LED-based applications for many years. However, no single launch condition is representative of the laser (e.g. VCSEL) sources that are used for gigabit and higher rate transmission. This fact drove the development of IEC 60793-1-49 for determining the effective modal bandwidth of laser optimized 50 μm fibres. See IEC 60793-2-10:2004 or later and IEC 61280-4-1:2003 or later for more information.

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 60793-1-20, *Optical Fibres – Part 1-20: Measurement methods and test procedures – Fibre geometry*

IEC 60793-1-42, *Optical fibres – Part 1-42: Measurement methods and test procedures – Chromatic dispersion*

IEC 60793-1-43, *Optical fibres – Part 1-43: Measurement methods and test procedures – Numerical aperture*

IEC 60793-1-49:2006, Optical fibres – Part 1-49: *Measurement methods and test procedures – Differential mode delay*