IEC 60793-2-10

Edition 4.0 2011-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres

Fibres optiques – Partie 2-10: Spécifications de produits – Spécification intermédiaire pour les fibres multimodales de catégorie A1

IEC 60793-2-10:2011

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub
The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, withdrawn and replaced publications.
- IEC Just Published: www.iec.ch/online_news/justpub
Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.
- Electropedia: www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.
- Customer Service Centre: www.iec.ch/webstore/custserv
If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:
Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm
Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,…). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.
- Just Published CEI: www.iec.ch/online_news/justpub
Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.
- Electropedia: www.electropedia.org
Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.
- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:
Email: csc@iec.ch
Tél.: +41 22 919 02 11
Fax: +41 22 919 03 00

IEC 60793-2-10

Edition 4.0 2011-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Optical fibres –
Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres

Fibres optiques –
Partie 2-10: Spécifications de produits – Spécification intermédiaire pour les fibres multimodales de catégorie A1

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX

W

ICS 33.180.10

ISBN 978-2-88912-406-0

CONTENTS

FOREWORD 4
1 Scope 6
2 Normative references 6
3 Specifications 7
3.1 General requirements 7
3.2 Dimensional requirements 8
3.3 Mechanical requirements 9
3.4 Transmission requirements 9
3.5 Environmental requirements 11
3.5.1 Overview 11
3.5.2 Mechanical environmental requirements (common to all fibres in category A1) 12
3.5.3 Transmission environmental requirements 13
Annex A (normative) Family specifications for A1a multimode fibres 14
Annex B (normative) Family specifications for A1b multimode fibres 16
Annex C (normative) Family specifications for A1d multimode fibres 18
Annex D (normative) Fibre differential mode delay (DMD) and calculated effective modal bandwidth (EMB_C) requirements 20
Annex E (informative) Modal bandwidth considerations and transmitter requirements 25
Annex F (informative) Bandwidth nomenclature explanation 27
Annex G (informative) Preliminary indications for items needing further study 28
Annex H (informative) Applications supported by A1 fibres 30
Annex I (informative) 1-Gbit, 10-Gbit, 40-Gbit and 100-Gbit Ethernet applications 34
Bibliography 38

Figure 1 – Relation between bandwidths at 850 nm and 1 300 nm 11
Figure D.1 – DMD template requirements 21

Table 1 – Dimensional attributes and measurement methods 8
Table 2 – Dimensional requirements common to category A1 fibres 8
Table 3 – Additional dimensional attributes required in the family specifications 8
Table 4 – Mechanical attributes and measurement methods 9
Table 5 – Mechanical requirements common to category A1 fibres 9
Table 6 – Transmission attributes and measurement methods 9
Table 7 – Additional transmission attributes required in family specifications 10
Table 8 – Environmental exposure tests 11
Table 9 – Attributes measured for environmental tests 11
Table 10 – Strip force for environmental tests 12
Table 11 – Tensile strength for environmental tests 12
Table 12 – Stress corrosion susceptibility for environmental tests 12
Table 13 – Change in attenuation for environmental tests 13
Table A.1 – Dimensional requirements specific to A1a fibres 14
Table A.2 – Mechanical requirements specific to A1a fibres 14

Table A.3 – Transmission requirements specific to A1a fibres 15
Table B.1 – Dimensional requirements specific to A1b fibres 16
Table B.2 – Mechanical requirements specific to A1b fibres 16
Table B.3 – Transmission requirements specific to A1b fibres 17
Table C.1 – Dimensional requirements specific to A1d fibres 18
Table C.2 – Mechanical requirements specific to A1d fibres 18
Table C.3 – Transmission requirements specific to A1d fibres 19
Table D.1 – DMD templates for A1a.2 fibres 20
Table D.2 – DMD interval masks for A1a.2 fibres 22
Table D.3 – DMD Weightings 23
Table D.4 – DMD templates for A1a.3 fibres 24
Table D.5 – DMD interval masks for A1a.3 fibres 24
Table F.1 – Bandwidth nomenclature explanation 27
Table H.1 – Some internationally standardised applications supported by A1a and/or A1b fibres 30
Table H.2 – Typically used commercial bandwidth specifications for A1a and A1b graded-index multimode fibres. 31
Table H.3 – Cross reference of fibre types and bandwidth cells for this standard and ISO/IEC 11801 32
Table I.1 – Summary of 1 Gbit/s , 10 Gbit/s , 40 Gbit/s and 100 Gbit/s Ethernet requirements and capabilities for A1b fibres 35
Table I.2 – Summary of 1 Gbit/s , 10 Gbit/s , 40 Gbit/s and 100 Gbit/s Ethernet requirements and capabilities for A1a.1 fibres 36
Table I.3 – Summary of 1 Gbit/s , 10 Gbit/s , 40 Gbit/s and 100 Gbit/s Ethernet requirements and capabilities for A1a.2 and A1a.3 fibres 37

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRES –

Part 2-10: Product specifications – Sectional specification for category A1 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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
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 60793-2-10 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This fourth edition cancels and replaces the third edition published in 2007. This edition constitutes a technical revision.

The major changes with respect to the previous edition are listed below:

- addition of type A1a.3 fibre;
- reduction of core diameter tolerance from 3,0 to 2,5 µm for A1a fibres.

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

CDV	Report on voting
86A/1295/CDV	86A/1328/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 the IEC 60793 series, published under the general title *Optical fibres* 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.