

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Optical fibres –
Part 2: Product specifications – General**

**Fibres optiques –
Partie 2: Spécifications de produits – Généralités**

IEC 60793-2:2007

<https://standards.iteh.ai/catalog/standards/iec/656e42a6-5097-412f-99a6-3ee71b20fcca/iec-60793-2-2007>

WITISOEAMN



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2007 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
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 It also gives information on projects, withdrawn and replaced publications.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

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Optical fibres –
Part 2: Product specifications – General**

**Fibres optiques –
Partie 2: Spécifications de produits – Généralités**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

J

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references	5
3 Terms and definitions	6
4 Quality assurance.....	7
5 Construction of optical fibres	7
5.1 Category A – Multimode fibres.....	7
5.2 Category B – Single-mode fibres	7
5.3 Category C – Single-mode fibres for intraconnection	8
6 General requirements.....	9
6.1 Coating	9
6.2 Buffer	9
6.3 Colours of the coating and/or buffer	9
Table 1 – Sectional specifications	5
Table 2 – Categories of multimode fibres.....	7
Table 3 – Categories of glass core/glass clad single-mode fibres.....	8
Table 4 – Categories of glass core/glass clad single mode fibres for intraconnection.....	8



(<https://standards.iteh.ai/>)
Document Preview

IEC 60793-2:2007

<https://standards.iteh.ai/c/60793-2-2007/standards/iec/656e42a6-5097-412f-99a6-3ee71b20fccca/iec-60793-2-2007>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRES –**Part 2: Product specifications –
General**

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This sixth edition cancels and replaces the fifth edition published in 2003. This modification has been necessary because of the addition of new fibre categories to IEC 60793-2-40, IEC 60793-2-50 and IEC 60793-2-60.

Document ID	Fibre category
60793-2-10	A1
60793-2-20	A2
60793-2-30	A3
60793-2-40	A4
60793-2-50	B (all)
60793-2-60	C

This standard is to be read in conjunction with IEC 60793-1 series.

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

FDIS	Report on voting
86A/1168/FDIS	86A/1192/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 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 maintenance result 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.

iteh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 60793-2:2007](https://standards.iteh.ai/standards/iec/60793-2-2007)

<https://standards.iteh.ai/c/60793-2-2007/standards/iec/60793-2-2007>

WITHDRAWN

OPTICAL FIBRES –

Part 2: Product specifications – General

1 Scope

This part of IEC 60793 contains the general specifications for both multimode and single-mode optical fibres. Sectional specifications for each of the four multimode categories: A1, A2, A3, and A4 contain requirements specific to each category. A sectional specification for all single-mode categories contains requirements common to all single-mode fibres. Within each sectional specification, family specifications – found as normative annexes – contain requirements for the applicable sub-categories. These sub-categories are distinguished on the basis of different fibre types or applications.

The requirements of this standard apply to all categories. Each sectional specification contains the requirements that are common to all the family specifications that are within it. These common requirements are copied to the family specification for ease of reference.

Tests or measurement methods are defined for each specified attribute. Where possible, these definitions are by reference to an IEC standard – otherwise the test or measurement method is outlined in the relevant sectional specification.

The following table defines the sectional specifications. The relevant family specifications are defined within the sectional specifications as normative annexes (see Tables 2 and 3)

Table 1 – Sectional specifications

Document ID	Fibre category	Cladding material	Core material	Index profile
60793-2-10	A1 multi-mode	Glass	Glass	Graded
60793-2-20	A2 multi-mode	Glass	Glass	Quasi step or step
60793-2-30	A3 multi-mode	Plastic	Glass	Step
60793-2-40	A4 multi-mode	Plastic	Plastic	Step, multi-step, or graded index fibre
60793-2-50	B single-mode	Glass	Glass	Not applicable
60793-2-60	C single mode	Glass	Glass	Not applicable

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 60304, *Standard colours for insulation for low-frequency cables and wires*

IEC 60793-1 (all parts), *Optical fibres – Part 1: Measurement methods and test procedures*

IEC 60793-2-10, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

IEC 60793-2-20, *Optical fibres – Part 2-20: Product specifications – Sectional specification for category A2 multimode fibres*

IEC 60793-2-30, *Optical fibres – Part 2-30: Product specifications – Sectional specification for category A3 multimode fibres*

IEC 60793-2-40, *Optical fibres – Part 2-40: Product specifications – Sectional specification for category A4 multimode fibres*

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

IEC 60793-2-60, *Optical fibres – Part 2-60: Product specifications – Sectional specification for category C single-mode intraconnection fibres*

3 Terms and definitions

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

3.1

multimode fibres

fibres for which the photons follow a multiplicity of paths through the fibre core. An optical fibre along whose core the radiation of two or more bound modes can propagate at the wavelength of interest

3.2

single-mode fibres

fibres for which only one light path is followed for wavelengths greater than the cut-off wavelength. An optical fibre in which the radiation of only one bound mode can propagate at the wavelength of interest

3.3

core

the central region of an optical fibre, generally with higher refractive index, through which most of the optical power is transmitted

3.4

cladding

the dielectric material of an optical fibre surrounding the core

3.5

primary coating

thin primary coating applied directly to the cladding, usually at the time of the fibre drawing, in one or more layers, to preserve the integrity of the cladding surface

NOTE A secondary coating may be applied directly to the primary coating, of one or more fibres, to reinforce the protection of the optical fibre during handling and cabling.

3.6

buffer

material or assembly of materials used to protect the optical fibre against physical damage

3.7

coloured coating and/or buffer

A thin coating and/or buffer applied on the primary coating and/or buffer or on the secondary coating in order to make each fibre distinguishable by its colour

4 Quality assurance

It is the responsibility of the supplier to establish quality assurance by quality control procedures which ensure that the product meets the requirements of this standard and the subsidiary sectional specifications and family specifications. It is not intended that a complete testing programme be carried out on every length of fibre. When the customer wishes to specify acceptance tests or other quality procedures, it is essential that an agreement be reached between the supplier and the customer at the time of ordering.

5 Construction of optical fibres

5.1 Category A – Multimode fibres

Fibre categories are based on g , the refractive index profile parameter.

The normalized index profile is expressed as:

$$\delta(x) = 1 - x^g \quad (1)$$

where

$$\delta(x) = \frac{n(x) - n(1)}{n(0) - n(1)} \quad (2a)$$

$$x = \frac{r}{a} \quad (0 \leq r \leq a) \text{ is the normalized radial position;} \quad (2b)$$

a is the core radius;

$n(x)$ is the refractive index at normalized position x .

Table 2 – Categories of multimode fibres

Category	Material	Type	Limits
A1	Glass core/glass cladding	Graded index fibre	$1 \leq g < 3$
A2	Glass core/glass cladding	Step and quasi step index fibre	$3 \leq g < \infty$
A3	Glass core/plastic cladding	Step index fibre	$10 \leq g < \infty$
A4	Plastic core/plastic cladding	Step, multi-step, or graded index fibre	$1 \leq g < \infty$

NOTE Attention is drawn to the index profile as stated in the detail specification. The fibre category is determined on the basis of the material type and the g value which best fits the normalized refractive index profile, falling within the category defined above.

5.2 Category B – Single-mode fibres

The categories of single-mode fibres currently in use are given in Table 3.

Table 3 – Categories of glass core/glass clad single-mode fibres

Category	Type	Description
B1.1	Dispersion unshifted	This dispersion unshifted single mode fibre is optimized for use in the 1 310 nm region but can be used in the 1 550 nm region. Depending on link length and bit rates, dispersion may need accommodation in the 1 550 nm region.
B1.2	Cut-off shifted	This category of dispersion unshifted single-mode fibre is optimized for low loss in the 1 550 nm region.
B1.3	Extended band	This category of dispersion unshifted single-mode fibre is to extend the range of possible transmission signals, using 1 310 nm band power budgets, to portions of the band above 1 360 nm and below 1 530 nm. Chromatic dispersion in this band may impose requirements either on the maximum link length, or the need for accommodation.
B2	Dispersion shifted	This dispersion-shifted single-mode fibre is optimized for single-channel transmission in the 1 550 nm region. Multiple channels can only be transmitted if care is taken to avoid the effects of four-wave mixing by, for example, moderating the power levels or appropriate spacing or placement of the channels.
B4	Non-zero dispersion-shifted	This dispersion-shifted single-mode fibre is optimized for multiple channel transmission in the 1 550 nm region. The dispersion coefficient is required to be non-zero throughout the band from 1 530 nm to 1 565 nm, but may be either positive or negative. Depending on the dispersion characteristics, multiple channel transmission may be possible at bands either above or below the normal 1 550 nm region.
B5	Wideband non-zero dispersion-shifted	This wideband non-zero dispersion-shifted single-mode fibre is optimized for multiple channel transmission in the wavelength range of 1460-1625 nm with the positive value of the chromatic dispersion coefficient that is greater than some non-zero value. This fibre can be used for both CWDM and DWDM system throughout the wavelength region between 1460 nm and 1625 nm.
B6	Bending loss insensitive single mode fibre	This category of single-mode fibre is optimized for improved bending loss. Two sub-categories are recognized: B6_a to be used in the O, E, S, C and L-band (i.e. throughout the 1260 to 1625 nm range). Fibres and requirements in this category are a subset of B1.3 fibres and have the same transmission and interconnection properties. B6_b suitable for transmission at 1310, 1550, and 1625 nm for restricted distances that are associated with in-building transport of signals. These fibres may have different splicing and connection properties than B1.3 fibres, but are capable at very low values of bend radius.

5.3 Category C – Single-mode fibres for intraconnection

The categories of single-mode fibres for intraconnection currently in use are given in Table 4.

Table 4 – Categories of glass core/glass clad single mode fibres for intraconnection

Category	Type	Description
C1	Single mode interconnection fibre suitable for use with any category B single mode fibre at wavelengths from 1260 nm to 1625 nm	This category of single mode fibre is optimized for precision glass geometry and improved macrobending, and generally having lower fibre cut-off wavelength compared to that of B1.1 fibres
C2	Single mode interconnection fibre suitable for use from 1260 nm to 1360 nm	This category of single mode fibre with reduced mode field diameter is optimized for loss performance in the 1310 nm region
C3	Single mode interconnection fibre suitable for use from 1530 nm to 1625 nm	This category of single mode fibre with reduced mode field diameter is optimized for loss performance in the 1550 nm region
C4	Single mode interconnection fibre suitable for use at 980 nm	This single-mode intraconnection fibre is intended to support 980 nm transmissions