

This is a preview - click here to buy the full publication



IEC 60793-2-40

Edition 4.0 2015-11

INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.10

ISBN 978-2-8322-3022-0

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	5
1 Scope	7
2 Normative references	8
3 Specifications	8
3.1 Dimensional requirements	8
3.2 Mechanical requirements	9
3.2.1 General	9
3.2.2 Tensile load test	10
3.3 Transmission requirements	11
3.4 Environmental requirements	12
3.4.1 General	12
3.4.2 Mechanical environmental requirements	13
3.4.3 Transmission environmental requirements	13
Annex A (normative) Family specifications for sub-category A4a multimode fibres	14
A.1 General	14
A.2 Dimensional requirements	14
A.3 Mechanical requirements	14
A.4 Transmission requirements	14
A.5 Environmental requirements	15
Annex B (normative) Family specifications for sub-category A4b multimode fibres	16
B.1 General	16
B.2 Dimensional requirements	16
B.3 Mechanical requirements	16
B.4 Transmission requirements	16
B.5 Environmental requirements	17
Annex C (normative) Family specifications for sub-category A4c multimode fibres	18
C.1 General	18
C.2 Dimensional requirements	18
C.3 Mechanical requirements	18
C.4 Transmission requirements	18
C.5 Environmental requirements	19
Annex D (normative) Family specifications for sub-category A4d multimode fibres	20
D.1 General	20
D.2 Dimensional requirements	20
D.3 Mechanical requirements	20
D.4 Transmission requirements	20
D.5 Environmental requirements	21
Annex E (normative) Family specifications for sub-category A4e multimode fibres	22
E.1 General	22
E.2 Dimensional requirements	22
E.3 Mechanical requirements	22
E.4 Transmission requirements	22
E.5 Environmental requirements	23
Annex F (normative) Family specifications for sub-category A4f multimode fibres	24
F.1 General	24

F.2	Dimensional requirements.....	24
F.3	Mechanical requirements	24
F.4	Transmission requirements	24
F.5	Environmental requirements	25
Annex G	(normative) Family specifications for sub-category A4g multimode fibres.....	26
G.1	General.....	26
G.2	Dimensional requirements.....	26
G.3	Mechanical requirements	26
G.4	Transmission requirements	26
G.5	Environmental requirements	27
Annex H	(normative) Family specifications for sub-category A4h multimode fibres.....	28
H.1	General.....	28
H.2	Dimensional requirements.....	28
H.3	Mechanical requirements	28
H.4	Transmission requirements	28
H.5	Environmental requirements	29
Annex I	(normative) Mode scramblers for sub-category A4a to A4d fibres.....	30
I.1	General.....	30
I.2	Specification for mode scramblers	30
Annex J	(informative) Additional transmission requirements for sub-category A4a multimode fibres for wavelengths below 650 nm	31
J.1	General.....	31
J.2	Transmission requirements	31
Bibliography	32
Figure 1	– Tensile load versus elongation for a plastic optical fibre	10
Figure I.1	– Mode scrambler for category A4 fibre	30
Table 1	– Characteristics and applications of category A4 fibres	7
Table 2	– Dimensional attributes and measurement methods	9
Table 3	– Requirements common to all category A4 fibres	9
Table 4	– Additional attributes required in A4f through A4h family specifications.....	9
Table 5	– Mechanical attributes and test methods.....	10
Table 6	– Requirements common to category A4 fibres.....	10
Table 7	– Additional attributes required in family specification for sub-category A4f through A4h fibres	10
Table 8	– Transmission attributes and measurement methods	11
Table 9	– Attributes required in family specifications.....	12
Table 10	– Environmental exposure tests.....	12
Table 11	– Attributes measured	12
Table 12	– Requirement for tensile strength.....	13
Table 13	– Requirement for change in attenuation for A4a through A4e fibre	13
Table 14	– Requirement for change in attenuation for A4f through A4h fibre	13
Table A.1	– Dimensional requirements specific to A4a fibres	14
Table A.2	– Mechanical requirements specific to A4a fibres	14
Table A.3	– Transmission requirements specific to A4a fibres.....	15

Table B.1 – Dimensional requirements specific to A4b fibres	16
Table B.2 – Mechanical requirements specific to A4b fibres	16
Table B.3 – Transmission requirements specific to A4b fibres	17
Table C.1 – Dimensional requirements specific to A4c fibres	18
Table C.2 – Mechanical requirements specific to A4c fibres	18
Table C.3 – Transmission requirements specific to A4c fibres	19
Table D.1 – Dimensional requirements specific to A4d fibres	20
Table D.2 – Mechanical requirements specific to A4d fibres	20
Table D.3 – Transmission requirements specific to A4d fibres	21
Table E.1 – Dimensional requirements specific to A4e fibres	22
Table E.2 – Mechanical requirements specific to A4e fibres	22
Table E.3 – Transmission requirements specific to A4e fibres	23
Table F.1 – Dimensional requirements specific to A4f fibres	24
Table F.2 – Mechanical requirements specific to A4f fibres	24
Table F.3 – Transmission requirements specific to A4f fibres	25
Table G.1 – Dimensional requirements specific to A4g fibres	26
Table G.2 – Mechanical requirements specific to A4g fibres	26
Table G.3 – Transmission requirements specific to A4g fibres	27
Table H.1 – Dimensional requirements specific to A4h fibres	28
Table H.2 – Mechanical requirements specific to A4h fibres	28
Table H.3 – Transmission requirements specific to A4h fibres	29
Table I.1 – Mode Scrambler parameters	30
Table J.1 – Transmission requirements specific to A4a.2 fibre	31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRES –

Part 2-40: Product specifications – Sectional specification for category A4 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 60793-2-40 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 2009. This edition constitutes a technical revision.

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

- a) harmonization of terminology within the IEC 60793-2 series;
- b) added measurement parameters for numerical aperture and fibre geometry.

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

CDV	Report on voting
86A/1587/CDV	86A/1618/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 in 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.

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

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 2-40: Product specifications – Sectional specification for category A4 multimode fibres

1 Scope

This part of IEC 60793-2 is applicable to category A4 optical multimode fibres and the related sub-categories A4a, A4b, A4c, A4d, A4e, A4f, A4g and A4h. These fibres have a plastic core and plastic cladding and may have step-index, multi-step index or graded-index profiles. The fibres are used in information transmission equipment and other applications employing similar light transmitting techniques, and finally in fibre optic cables. Table 1 summarizes some of the salient characteristics and applications of these fibres.

Table 1 – Characteristics and applications of category A4 fibres

Sub-category	A4a	A4b	A4c	A4d	A4e	A4f	A4g	A4h
Core diameter (µm)	See Note 1	See Note 1	See Note 1	See Note 1	≥ 500	200	120	62,5
Cladding diameter (µm)	1 000	750	500	1 000	750	490	490	245
Numerical aperture Na_{ff}	0,50	0,50	0,50	0,30	0,25	0,190	0,190	0,190
Operating wavelength (s) (nm)	650 See Note 2	650	650	650	650	650 850 1 300	650 850 1 300	850 1 300
Applications	Digital audio interface, automobile, industrial, sensor and data transmission	Industrial and sensor	Sensor	Digital audiovisual interface and data transmission	Digital audiovisual interface and data transmission	Industrial and mobile; compatible with A3 transmission equipment	Data transmission	Data transmission; primarily used in ribbon structures
NOTE 1 Typically 15 µm to 35 µm smaller than the cladding diameter.								
NOTE 2 Other potential wavelengths for A4a fibre are described in Annex J.								

In addition to the applications shown in Table 1, other applications for A4 fibres include, but are not restricted to, the following: support for short reach, high bit-rate systems in telephony, distribution and local networks, carrying data, voice and/or video services and on-premises intrabuilding and interbuilding fibre installations, including LANs, PBXs, video, various multiplexing uses and miscellaneous related uses, such as consumer electronics and industrial and mobile networks.

Three types of requirements apply to A4 fibres:

- general requirements, as defined in IEC 60793-2;
- specific requirements common to category A4 multimode fibres covered in this standard and which are given in Clause 3;

- particular requirements applicable to individual fibre sub-categories and implementations or specific applications which are defined in this standard, in the normative family specification annexes.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60793-1-20:2001, *Optical fibres – Part 1-20: Measurement methods and test procedures – Fibre geometry*

IEC 60793-1-22, *Optical fibres – Part 1-22: Measurement methods and test procedures – Length measurement*

IEC 60793-1-40:2001, *Optical fibres – Part 1-40: Measurement methods and test procedures – Attenuation*

IEC 60793-1-41, *Optical fibres – Part 1-41: Measurement methods and test procedures – Bandwidth*

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 measurement*

IEC 60793-1-46, *Optical fibres – Part 1-46: Measurement methods and test procedures – Monitoring of changes in optical transmittance*

IEC 60793-1-47:2009, *Optical fibres – Part 1-47: Measurement methods and test procedures – Macrobending loss*

IEC 60793-1-50, *Optical fibres – Part 1-50: Measurement methods and test procedures – Damp heat (steady state) tests*

IEC 60793-1-51, *Optical fibres – Part 1-51: Measurement methods and test procedures – Dry heat (steady state) tests*

IEC 60793-1-52, *Optical fibres – Part 1-52: Measurement methods and test procedures – Change of temperature tests*