

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Optical fibre cables – **STANDARD PREVIEW**
Part 2-41: Indoor cables – Product specification for simplex and duplex buffered
A4 fibres
(standards.iteh.ai)

Câbles à fibres optiques – **IEC 60794-2-41:2008**
Partie 2-41: Câbles intérieurs – **Spécification de produits pour fibres A4 simplex**
et duplex sous revêtement protecteur





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Optical fibre cables –
Part 2-41: Indoor cables – Product specification for simplex and duplex buffered
A4 fibres

Câbles à fibres optiques
Partie 2-41: Câbles intérieurs – Spécification de produits pour fibres A4 simplex
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

**Part 2-41: Indoor cables –
Product specification for simplex and duplex buffered A4 fibres**

FOREWORD

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International Standard IEC 60794-2-41 has been prepared by sub-committee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This bilingual version (2014-07) corresponds to the English version, published in 2008-06.

This standard is to be used in conjunction with IEC 60794-1-1 and IEC 60794-1-2, and IEC 60794-2. A blank detail specification is provided in Annex A.

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

FDIS	Report on voting
86A/1215/FDIS	86A/1227/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.

The French version of this standard has not been voted upon.

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

A list of all parts of the IEC 60794 series, published under the general title *Optical fibre cables*, 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

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[IEC 60794-2-41:2008](#)

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OPTICAL FIBRE CABLES –

Part 2-41: Indoor cables – Product specification for simplex and duplex buffered A4 fibres

1 Scope

This part of IEC 60794 covers simplex and duplex buffered A4a through A4g fibres for indoor use. These may be cut into short lengths, which can be used in patchcord cable assemblies. The requirements of sectional specification IEC 60794-2 are applicable to cables covered by this standard.

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 60189-1, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*

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

IEC 60793-1-21, *Optical fibres – Part 1-21: Measurement methods and test procedures – Coating geometry*

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

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

IEC 60793-1-51, *Optical fibres – Part 1-51: Measurement methods and test procedures – Dry heat*

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

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

IEC 60794-1-1, *Optical fibre cables – Part 1-1: Generic specification – General*

IEC 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures*

IEC 60794-2:2002, *Optical fibre cables – Part 2: Indoor cables – Sectional specification*

3 Construction

3.1 General

In addition to the constructional requirements in IEC 60794-2, the following considerations apply to simplex and duplex buffered A4a through A4g fibres.

The buffered fibre shall be designed and manufactured for an expected operating lifetime of at least 15 years. In this context, the attenuation of the installed cable at the operational wavelength(s) shall not exceed values agreed between the customer and supplier. The materials in the cable shall not present a health hazard within its intended use.

There shall be no fibre splice in a delivery length unless otherwise agreed by the customer and supplier.

3.2 Optical fibres

Multimode Category A4a through A4g optical fibres shall be used that meet the requirements of IEC 60793-2-40.

3.3 Buffer

The buffer shall consist of one or more layers of inert material. For tight buffers, the buffer shall be easily removable in one operation over a length of 15 mm to 25 mm, depending on customer requirements. For semi-tight buffers, the buffer shall be easily removable over a length of 0,2 m to 2,0 m.

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3.4 Strength and anti-buckling members

[IEC 60794-2-41:2008](https://standards.iteh.ai/catalog/standards/sist/973aaa46-f352-4f5d-a066-233ee4dcaa46/iec-60794-2-41-2008)

None.

<https://standards.iteh.ai/catalog/standards/sist/973aaa46-f352-4f5d-a066-233ee4dcaa46/iec-60794-2-41-2008>

3.5 Ripcord

None.

3.6 Sheath

None.

3.7 Marking

If required, the buffer shall be marked as agreed between the customer and supplier.

3.8 Identification

None.

3.9 Examples of constructions

Examples of buffered fibre constructions are shown in Figure 1.

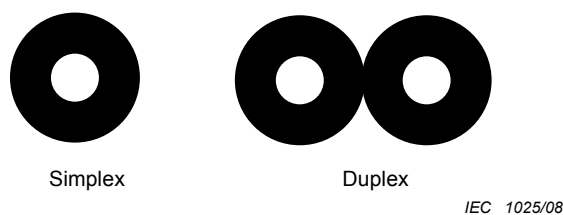


Figure 1 – Examples of buffered fibres.

4 Dimensions

The fibre dimensions shall comply with IEC 60793-2-40.

Buffer dimensions are shown in Table 1.

Table 1 – Dimensions of buffered fibre

Fibre type		Nominal dimensions mm	Tolerances
A4a, A4b, A4d, A4e, A4f, A4g	Simplex	2,2	$\pm 0,1$
	Duplex	2,2 x 4,4	Minor axis: $\pm 0,1$ Major axis: $\pm 0,2$
A4c	Simplex	1,5	$\pm 0,1$
	Duplex	1,5 x 3,0	Minor axis: $\pm 0,1$ Major axis: $\pm 0,2$

5 Tests

5.1 General

Compliance with specification requirements shall be verified by carrying out tests selected from the following subclauses. It is not intended that all the tests shall be performed. The frequency of testing shall be agreed between the customer and supplier.

Unless otherwise specified, all tests shall be carried out at ambient temperature.

5.2 Dimensions

The fibre dimensions and tolerances shall be checked in accordance with test method IEC 60793-1-20 or IEC 60793-1-21. The diameter of the buffer shall be measured in accordance with the methods of IEC 60189-1.

5.3 Mechanical requirements

5.3.1 General

Some of the following tests can be performed on a short sample length of buffered fibre that is still an integral part of a longer length. Thus it becomes possible to detect permanent changes in attenuation. Launch conditions to measure changes in attenuation shall be in conformity with IEC 60793-2-40.

5.3.2 Tensile performance

Method: IEC 60794-1-2-E1B (Equipment is the same, but the procedure is modified so that sufficient load is applied until 4 % elongation is achieved. At that point, the load is immediately released.)

Rate of transfer device: Either 100 mm/min or 100 N/min.

Length of sample between clamps: 100 mm to 200 mm.

Requirements: For elongation at 4 %, the loads shall exceed the loads shown in Table 2. Change in attenuation shall not exceed 0,2 dB at least 1 min after the load is released. The load shall be released at the instant the 4 % elongation is reached.

Table 2 – Minimum tensile load for 4 % elongation

Fibre type		A4a and A4d	A4b and A4e	A4c	A4f, A4g
Tensile load (N) at 4 % elongation (minimum)	Simplex	56	36	16	8
	Duplex	112	72	32	16

NOTE Elongation to breaking point is not applicable to A4 fibres.

5.3.3 Crush

Method: IEC 60794-1-2-E3.

Force: 7 N/mm for simplex, 14 N/mm for duplex.

Duration: 3 min.

Requirements: Change in attenuation shall not exceed 0,2 dB at least 1 min after the test. Under visual examination there shall be no splitting of the buffer.

NOTE In the case of duplex buffered fibres, the force is applied on the flat sides of buffered fibre.

5.3.4 Impact

Method: IEC 60794-1-2-E4.

Radius of striking surface: 12,5 mm.

Impact energy: 0,2 J.

Number of impacts: at least 3, each separated by at least 500 mm.

Requirements: Change in attenuation shall not exceed 0,2 dB at least 1 min after the test. Under visual examination there shall be no splitting of the buffer.

NOTE In the case of duplex buffered fibres, the force is applied on the flat sides of buffered fibre.

5.3.5 Bend

Method: IEC 60794-1-2-E11A.

Mandrel diameter: 50 mm.

Number of turns per helix: 6.

Number of cycles: 10.

Requirements: Change in attenuation shall not exceed 0,2 dB after the test. Under visual examination there shall be no splitting of the buffer.

NOTE In the case of duplex buffered fibres, the sample is fixed to the apparatus so that bending is perpendicular to the major axis of the buffered fibre.

5.3.6 Repeated bending

Method: IEC 60794-1-2-E6.

Bending radius: 15 mm.

Number of cycles: 1 000.

Mass of weights: 0,5 kg for simplex buffered fibres, 1,0 kg for duplex buffered fibres.

Requirements: Change in attenuation shall not exceed 0,2 dB at least 1 min after the test. Under visual examination there shall be no splitting of the buffer.

NOTE In the case of duplex buffered fibres, the sample is fixed to the apparatus so that bending is perpendicular to the major axis of the buffered fibre.

5.3.7 Bend at low temperature

None.

[IEC 60794-2-41:2008](https://standards.iteh.ai/catalog/standards/sist/973aaa46-f352-4f5d-a066-233ee4dcaa46/iec-60794-2-41-2008)

5.3.8 Flexing

<https://standards.iteh.ai/catalog/standards/sist/973aaa46-f352-4f5d-a066-233ee4dcaa46/iec-60794-2-41-2008>

None.

5.3.9 Torsion

Method: IEC 60794-1-2-E7.

Number of cycles: 20.

Distance between fixed and rotating clamp: 250 mm.

Mass of weight: 0,5 kg.

Requirement: Change in attenuation shall not exceed 0,2 dB after the test.

NOTE This test is applicable only for simplex buffered fibres.

5.3.10 Kink

Not applicable.

5.4 Environmental requirements

Environmental exposure tests and measurement methods are documented in two forms:

- relevant environmental attributes, test methods and test conditions given in Table 3;

- measurements of a particular mechanical and transmission attribute that may change during exposure to the environmental test, as listed in Table 4.

Table 3 – Environmental exposure tests

Test condition ^a	Environment	Test method ^b	Test condition ^c
A	Damp heat	IEC 60793-1-50	+75 °C, 85 % RH, 30 days
	Dry heat	IEC 60793-1-51	+85 °C, 30 days
	Change of temperature	IEC 60793-1-52	Ta:-40 °C, Tb:+85 °C
B	Damp heat	IEC 60793-1-50	+60 °C, 85 % RH, 30 days
	Dry heat	IEC 60793-1-51	+70 °C, 30 days
	Change of temperature	IEC 60793-1-52	Ta:-20 °C, Tb:+70 °C
^a Test condition A or B should be agreed between supplier and customer. ^b Although these test methods do not specifically mention their applicability to A4 fibres, the test methods should nevertheless be used. ^c These test conditions supersede any that might be specified in the indicated test methods.			

Table 4 – Attributes measured

Attribute	Measurement method
Change in optical transmission	IEC 60793-1-46
Tensile performance	IEC 60794-1-2-E1B

These tests are normally conducted periodically as type-tests for a fibre and buffer design. Unless otherwise specified:

- the specimen shall be pre-conditioned by keeping it at standard atmospheric conditions for at least 24 h, and
- the recovery period allowed between the completion of the environmental exposure and measuring the attributes shall be as stated in the particular environmental test method.

5.4.1 Mechanical environmental requirement

Tensile strength shall be verified following removal of the fibre from the environment.

Table 5 – Requirement for tensile strength

Environment	Maximum change of tensile load at 4 % elongation
Damp heat	±25 %

5.4.2 Transmission environmental requirements

Change in attenuation from the initial value shall not exceed the values in Table 6.

Table 6 – Requirement for change in attenuation

Environment	Maximum attenuation increase	
	A4a to A4e fibres (dB over 100 m) wavelength 650 nm	A4f and A4g fibres (dB over 100 m) wavelength 650 nm, 850 nm and/or 1 300 nm
Damp heat	5 (Includes attenuation due to water absorption)	5 (Includes attenuation due to water absorption)
Dry heat	2	2
Change of temperature	2	2

5.5 Transmission requirements

The transmission requirements shall be in accordance with IEC 60793-2-40. Values for bandwidth and attenuation requirements shall be as agreed between customer and supplier.

5.6 Fire performance

IEC TR 62222 provides guidance and recommendations for the requirements and test methods for the fire performance of communication cables when installed in buildings. The recommendations relate to typical applications and installation practices, and an assessment of the fire hazards presented. Applicable legislation and regulation are also taken into account.

<https://standards.iteh.ai/catalog/standards/sist/973aaa46-f352-4f5d-a066-233ee4dcaa46/iec-60794-2-41-2008>

IEC TR 62222 references several IEC fire performance test methods and also other test methods that may be required by local or national legislation and regulation. The tests to be applied, and the requirements, shall be agreed between the customer and supplier taking into account the fire hazard presented by the end use application in which the cable is intended to be used.