IEC 60794-1-31

Edition 2.0 2021-06
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Optical fibre cables –
Part 1-31: Generic specification – Optical cable elements – Optical fibre ribbon

IEC 60794-1-31:2021-06 RLV(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.10; 33.180.99

ISBN 978-2-8322-9975-3

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OPTICAL FIBRE CABLES –

Part 1-31: Generic specification – Optical cable elements – Optical fibre ribbon

FOREWORD

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IEC 60794-1-31 has been prepared by subcommittee SC86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is an International Standard.

This second edition cancels and replaces the first edition published in 2018. This edition constitutes a technical revision.

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

a) The geometrical requirements for optical fibre ribbon with typically 250 µm coating diameter have been modified and those for the optical fibre ribbon with typically 200 µm coating diameter have been added.
b) "Identification by positional identification" and "Identification by ribbon coding and fibre colouring" are moved to a new informative Annex A.

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OPTICAL FIBRE CABLES –

Part 1-31: Generic specification – Optical cable elements – Optical fibre ribbon

1 Scope

This part of IEC 60794, which is a generic specification, covers optical fibre ribbons. Requirements which are described in this part apply to optical fibre ribbon cables for use with telecommunication equipment and devices employing similar techniques, in particular optical fibre cables in IEC 60794-2 for indoor use, in IEC 60794-3 for outdoor use, in IEC 60794-4 for self-supporting overhead use, in IEC 60794-5 for air blown use and in ~~IEC 60794-3~~ IEC 60794-6 for indoor/outdoor use. The detailed specification can be verified in specifications for each application ~~are given in~~ such as IEC 60794-2 and IEC 60794-3.

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4 Requirements

4.1 General

Optical fibre ribbons are optical fibres which can be assembled in a composite linear array.

Fibres shall be arranged in parallel and formed into ribbons of typically four, six, eight, twelve, sixteen, twenty-four, thirty-two, or thirty-six fibres each according to user requirements, and shall be capable of mass splicing.

Some parameters shall be measured in the ribbon since the corresponding tests on the primary coated fibre or finished cable are not sufficient for complete characterization. These parameters are identified below.

4.2 Construction

4.2.1 Ribbon structure

Ribbon structures are typically designated as edge-bonded, encapsulated or partially-bonded. Edge-bonded and encapsulated structures are differentiated by the amount of buffering afforded to the fibres by the bonding agent. The partially-bonded ribbon ~~may~~ can be of either structure but with the buffer applied periodically.

Figure 1 illustrates the edge-bonded structure in which the bonding agent is applied predominantly between the fibres. Figure 2 illustrates the encapsulated structure in which the bonding agent extends well beyond the extreme surface of any fibre. Figure 3 illustrates the partially-bonded structure in which neighbouring fibres are fixed together periodically in the longitudinal direction.

The edge-bonded and encapsulated ribbons are predominantly rigid in the transverse direction. The partially-bonded structure enables the optical fibre ribbon to be rolled up easily and accommodated very tightly in cables.

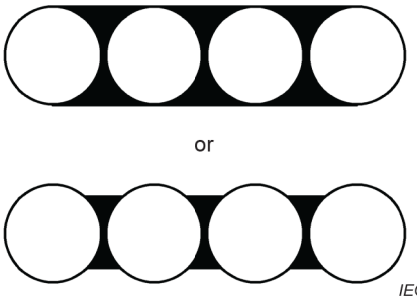


Figure 1 – Cross-section of a typical edge-bonded ribbon (thinner ribbon)

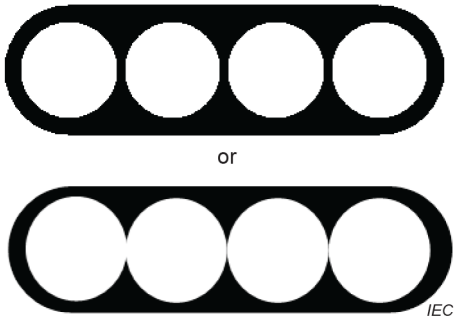


Figure 2 – Cross-section of a typical encapsulated ribbon (thicker ribbon)

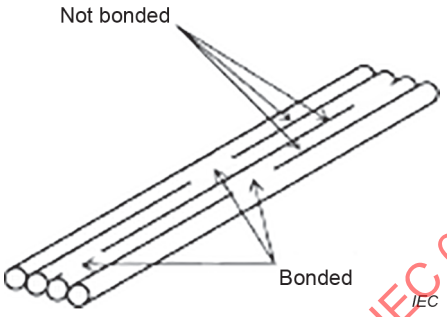


Figure 3 – Overview of a typical partially-bonded ribbon

4.2.2 Optical fibres

Category A1 multimode fibres which meet the requirements of IEC 60793-2-10 or Category B single-mode optical fibres which meet the requirements of IEC 60793-2-50 shall be used. Diameter over the fibre coating is typically 250 µm or 200 µm. Other fibres may be used to construct ribbons meeting the intent of this specification. Additional considerations with respect to connectivity and tools are required when dealing with ribbons containing different fibre dimensions.

~~NOTE Dimensions for ribbons with fibre coatings other than the typical 250 µm can be established between the customer and supplier. There exist alternative coating diameters (such as 200 µm) which can be used and require additional considerations with respect to connectivity and tools.~~

4.3 Dimensions

Unless otherwise specified in the detail specification, the maximum dimensions and the structural geometry of optical fibre ribbons shall be as shown in Table 1 for typical 250 µm coating diameter fibres and Table 2 for typical 200 µm coating diameter fibres. The definitions of each dimension are defined in IEC 60794-1-23 and illustrated in Figure 4.

Table 1 – Maximum dimensions of optical fibre ribbons for typical 250 µm coating diameter fibre

Number of fibres[a]	Width	Height		
			Extreme fibres	Planarity
	w	*h*	*b*	*p*
	µm	µm	µm	µm
4	1 220	360	786	50
6	1 648	360	1 310	50
8	~~2 300[e]~~ 2 172	~~380~~ 360	1 834	50
8	2 300	380	Per 4f unit[b]	Per 4f unit[b]
12	3 400	~~380~~ 360	2 882	75
16	4 340	360	3 930	100
16	4 400	380	Per 8f unit[b]	Per 8f unit[b]
24	6 500	380[c]	Per 12f unit[b]	Per 12f unit[b]
32[d]	~~4 400~~ 8 688	~~ffs [e]~~ 380[c]	Per 8f unit[b]	Per 8f unit[b]
36	9 800	380[c]	Per 12f unit[b]	Per 12f unit[b]

If the ribbon has flexibility, for example in the case of having a partially-bonded configuration, the dimensions of the ribbon should be measured under the condition in which the tested ribbon is configured in such a way where all the individual fibres are aligned ~~to be a coplanar~~ in approximately the same plane across the ribbon width, with the ribbon in an unexpanded state. The example of a typical partially-bonded ribbon is illustrated in Figure 3.

[a] Dimensions for other ribbons with fibre counts not listed above should be established between the customer and supplier.

[b] Per unit values are measured with the ribbon separated into the intended sub-units.

[c] ~~Maximum width shall be 2 300 in case the 8-fibre ribbon can be separated into two four-fibre sub-units.~~ The maximum height of 380 µm can be used in case the optical fibre ribbon can be separated into sub-units.

~~[d] A thirty-two-fibre ribbon consists of two layers of sixteen-fibre ribbons.~~

~~[e] ffs= for further specification.~~

Table 2 – Maximum dimensions of optical fibre ribbons for typical 200 µm coating diameter fibre

Number of fibres[a]	Width	Height	Fibre alignment	
			Extreme fibres	Planarity
	w	*h*	*b*	*p*
	µm	µm	µm	µm
4	1 130	325	685	50
6	1 570	325	1 142	50
8	2 010	325	1 598	50
8	TBD	TBD	Per 4f unit[c]	Per 4f unit[c]
12	2 890	325	2512	75
16	3 770	325	3425	100
16	TBD	TBD	Per 8f unit[c]	Per 8f unit[c]
24[b]	TBD	TBD	TBD	TBD
32[b]	TBD	TBD	TBD	TBD
36[b]	TBD	TBD	TBD	TBD

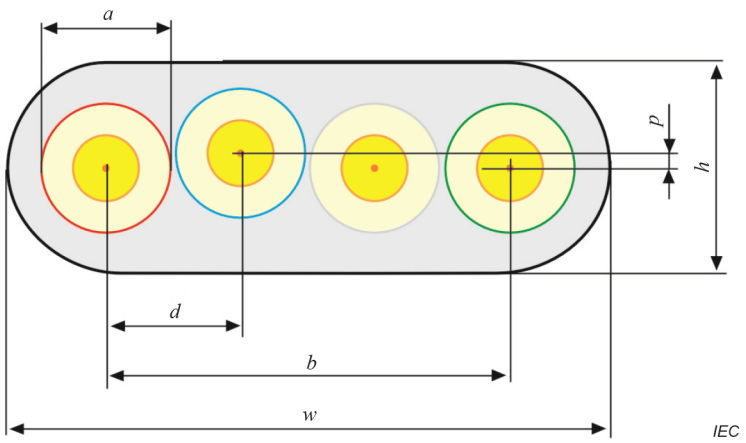
If the ribbon has flexibility, for example in the case of having a partially-bonded configuration, the dimensions of the ribbon should be measured under the condition in which the tested ribbon is configured in such a way where all the individual fibres are aligned in approximately the same plane across the ribbon width, with the ribbon in an unexpanded state. The example of a typical partially-bonded ribbon is illustrated in Figure 3.

For optical fibre ribbons for a typical 200 µm coating diameter fibre where neighbouring fibres are not in contact with each other as illustrated in Figure 1 and Figure 2 (upper figure), or in partially-bonded structure as illustrated in Figure 3, a greater value can be agreed between manufacturer and user. Even in that case, the maximum width (w) and extreme fibres (b) should not exceed those of optical fibre ribbon for typical 250 µm coating diameter fibre as shown in Table 1.

[a] Dimensions for other ribbons with fibre counts not listed above should be established between the customer and supplier.

[b] For these fibre counts, the optical fibre ribbon can be separated into sub-units if designed to do so.

[c] Per unit values are measured with the ribbon separated into the intended sub-units.



Key

a diameter of a coloured fibre

w width of that area

h height of that area

d distance between adjacent fibres

b distance between the extreme fibres

p planarity of the ribbon which is defined as the sum of the absolute values of the maximum positive and maximum negative vertical separation from the basis line

In consideration of the precision of fibre geometric attributes and the relatively larger precision of ribbon geometry requirements, it is acceptable for glass core/glass cladding fibres to use the edge of the cladding for the measurements according to Table 1 and Table 2, as illustrated in Figure 4, in lieu of the fibre centres. In this case, the measurements shall be made on the same side of all fibres (e.g. top or bottom, left or right side). This is consistent with IEC 60794-1-23, method G2.

NOTE The maximum dimensions and the structural geometry of optical fibre ribbons for 24 or more typical 200 µm coating diameter fibres are currently under study.

Figure 4 – Example of cross-sectional drawing illustrating fibre ribbon geometry (four-fibre ribbon)

More stringent requirements may be agreed between the customer and supplier, as needed, depending on the splice or the connector technique employed.

The dimensions and structural geometry can be verified with a type test, described as the visual measurement method (IEC 60794-1-23, method G2) to establish and ensure proper control of the ribbon manufacturing process. Once the process is established, and in order to ensure functional performance, the width and height of the ribbons may be controlled and verified, for final inspection purposes, with an aperture gauge (IEC 60794-1-23, method G3) or by the visual measurement method.

4.4 Mechanical requirements

4.4.1 General

The optical fibre ribbon shall satisfy the specifications and be tested as indicated in 4.4.2 and 4.4.4.

Detailed specifications of an optical fibre ribbon shall be verified by application, such as indoor and outdoor use, and are described in the sectional specifications for optical cables. ~~Optical fibre ribbon shall satisfy specifications and be tested as indicated below.~~

4.4.2 Separability of individual fibres from a ribbon

Fibre breakout capability at some level is generally required. Some ribbons of any type ~~may be intended to~~ can be separated into predefined units. Specific requirements for breakout and separability shall be as specified in the detail specifications.

The ribbons shall be constructed in such a way that fibres can be separated from the ribbon construction, and formed into sub-units or individual optical fibres, as specified in the detail specification, while meeting the following criteria:

- the ribbon shall be tested for the ability to break out individual fibres using the tear (separability) test shown in IEC 60794-1-23, method G5, or a method agreed upon between the customer and supplier;
- the end breakout shall be accomplished without specialized tools or apparatus;
- the mid-span breakout shall be accomplished following the ribbon manufacturer's procedures;
- the fibre breakout procedure shall not be permanently detrimental to the optical and mechanical performance of the fibre;
- any colour coding of fibres shall remain sufficiently intact within any 25 mm segment to enable individual fibres to be distinguished from each other.

4.4.3 Ribbon stripping

The coating of individual fibres as well as the residual ribbon bonding material shall be easily removable by an adequate stripping method, preferably thermal stripping. The ribbon bonding materials and primary coating layers should be removed as a "strip" to avoid excess dust generation. The method of removal shall be agreed between the customer and supplier or shall be defined in the detail specification.

4.4.4 Torsion

The mechanical and functional integrity of a fibre ribbon can be verified by carrying out the torsion test shown in IEC 60794-1-23, method G6.

4.5 Identification of the ribbon

~~4.5.1 General~~

Each fibre within a ribbon cable shall be uniquely identifiable using some scheme of ribbon identification and fibre identification within a ribbon. Common schemes include ribbon coding by printed legends, ribbon positioning (tubes, slots, etc.), fibre positional colour coding, colour coded matrix and fibre colour coding within a ribbon. Fibres within each ribbon shall be identified by an agreed colour coding scheme or positional scheme. Examples of the colour coding scheme and positional scheme are described in Annex A. Specific colour order is not defined in IEC cable specifications due to regional differences. The guidance regarding the colour coding scheme is given in IEC TR 61394. The scheme shall be defined in the detail specification.

Annex A
(informative)

Fibre identification

A.1 Identification by positional identification

If positional identification is specified, the scheme may follow the scheme described below and illustrated in Figure A.1. The fibre ~~shall~~ should be distinguishable by means of colour coding and positioning. For example (see Figure A.1):

a) a fibre ribbon has an identification coloured fibre on one side of the ribbon and a sub-identification coloured one on the other side or has two identification coloured fibres on one side. Sub-identification colour code can be used when the optical fibre ribbons are larger in number than the identification colour code;

b) any colour of the identification fibre colours group is different from that of the sub-identification fibre colours group. The side of the identification colours group corresponds to fibre no. 1 in the ribbon;

c) the colour types and the order used for identification and sub-identification should be agreed between the customer and the supplier. The colours of the other fibres ~~shall~~ should be agreed between the customer and the supplier;

d) the colour range used is as described in IEC 60304. The specific colour order is not defined in IEC cable specifications due to regional differences. ~~There are plans to collect the different regional colour schemes in a technical report.~~ The guidance will be described in IEC TR 63194 for colour coding scheme.

NOTE 1 The identification colour enables each fibre ribbon to be identified individually within a group of ribbons.

NOTE 2 The sub-identification colour shows the ribbon group.

NOTE 3 The identification and the sub-identification colour in a ribbon enables each fibre to be identified individually within the ribbon.

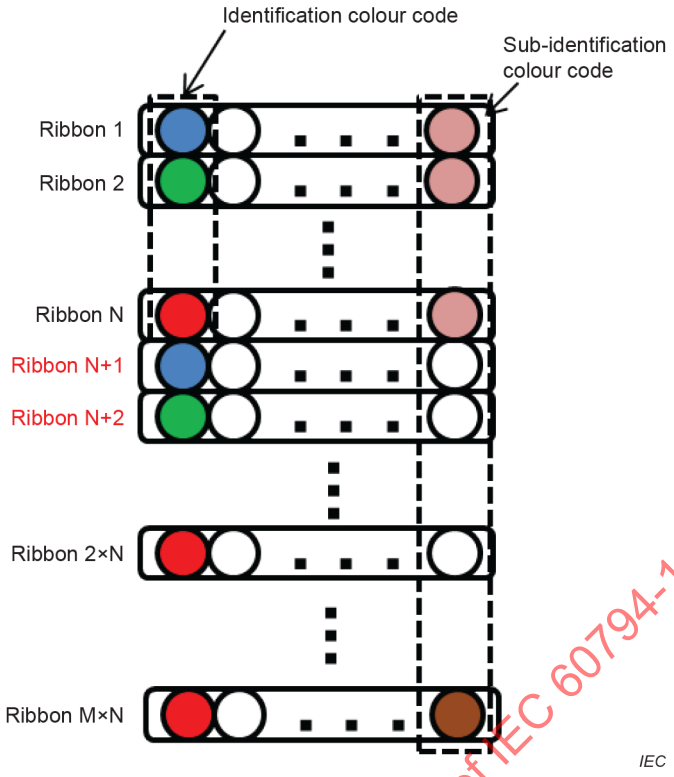


Figure A.1 – Example of identification by means of colour coding and positioning

A.2 Identification by ribbon coding and fibre colouring

Ribbon coding may use printed legends establishing the ribbon number, directly. This ~~may~~ can be accomplished by numbering, colour abbreviations corresponding to the agreed coding scheme, blocks or hachures, or other methods meeting this intent.

Fibres within each ribbon ~~shall~~ should be identified by an agreed colour coding scheme or positional scheme as in Clause A.1. Specific colour order is not defined in IEC cable specifications due to regional differences. ~~There are plans to collect the different regional colour schemes in a technical report.~~ The guidance regarding the colour coding scheme is given in IEC TR 63194.

Bibliography

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Partie 1-31: Spécification générique – Éléments de câbles optiques – Rubans de fibres optiques

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ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Requirements

4.1 General

Optical fibre ribbons are optical fibres which can be assembled in a composite linear array.

Fibres shall be arranged in parallel and formed into ribbons of typically four, six, eight, twelve, sixteen, twenty-four, thirty-two, or thirty-six fibres each according to user requirements, and shall be capable of mass splicing.

Some parameters shall be measured in the ribbon since the corresponding tests on the primary coated fibre or finished cable are not sufficient for complete characterization. These parameters are identified below.

4.2 Construction

4.2.1 Ribbon structure

Ribbon structures are typically designated as edge-bonded, encapsulated or partially-bonded. Edge-bonded and encapsulated structures are differentiated by the amount of buffering afforded to the fibres by the bonding agent. The partially-bonded ribbon can be of either structure but with the buffer applied periodically.

Figure 1 illustrates the edge-bonded structure in which the bonding agent is applied predominantly between the fibres. Figure 2 illustrates the encapsulated structure in which the bonding agent extends well beyond the extreme surface of any fibre. Figure 3 illustrates the partially-bonded structure in which neighbouring fibres are fixed together periodically in the longitudinal direction.

The edge-bonded and encapsulated ribbons are predominantly rigid in the transverse direction. The partially-bonded structure enables the optical fibre ribbon to be rolled up easily and accommodated very tightly in cables.

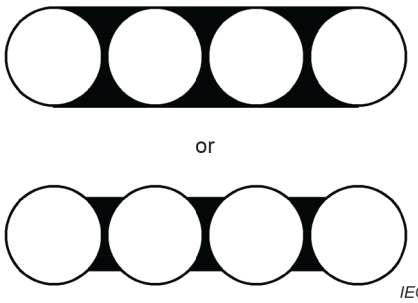


Figure 1 – Cross-section of a typical edge-bonded ribbon (thinner ribbon)

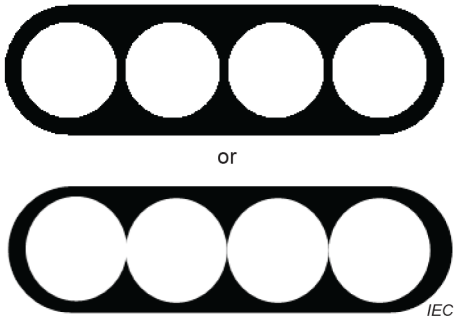


Figure 2 – Cross-section of a typical encapsulated ribbon (thicker ribbon)

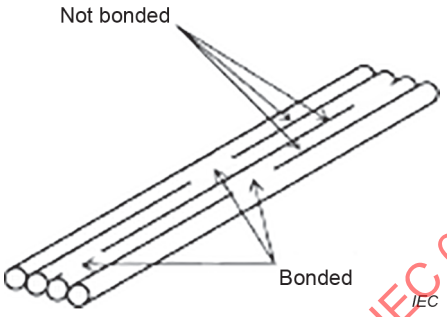


Figure 3 – Overview of a typical partially-bonded ribbon

4.2.2 Optical fibres

Category A1 multimode fibres which meet the requirements of IEC 60793-2-10 or Category B single-mode optical fibres which meet the requirements of IEC 60793-2-50 shall be used. Diameter over the fibre coating is typically 250 µm or 200 µm. Other fibres may be used to construct ribbons meeting the intent of this specification. Additional considerations with respect to connectivity and tools are required when dealing with ribbons containing different fibre dimensions.

4.3 Dimensions

Unless otherwise specified in the detail specification, the maximum dimensions and the structural geometry of optical fibre ribbons shall be as shown in Table 1 for typical 250 µm coating diameter fibres and Table 2 for typical 200 µm coating diameter fibres. The definitions of each dimension are defined in IEC 60794-1-23 and illustrated in Figure 4.

Table 1 – Maximum dimensions of optical fibre ribbons for typical 250 µm coating diameter fibre

Number of fibres[a]	Width	Height		
			Extreme fibres	Planarity
	w	*h*	*b*	*p*
	µm	µm	µm	µm
4	1 220	360	786	50
6	1 648	360	1 310	50
8	2 172	360	1 834	50
8	2 300	380	Per 4f unit[b]	Per 4f unit[b]
12	3 400	360	2 882	75
16	4 340	360	3 930	100
16	4 400	380	Per 8f unit[b]	Per 8f unit[b]
24	6 500	380[c]	Per 12f unit[b]	Per 12f unit[b]
32	8 688	380[c]	Per 8f unit[b]	Per 8f unit[b]
36	9 800	380[c]	Per 12f unit[b]	Per 12f unit[b]

If the ribbon has flexibility, for example in the case of having a partially-bonded configuration, the dimensions of the ribbon should be measured under the condition in which the tested ribbon is configured in such a way where all the individual fibres are aligned in approximately the same plane across the ribbon width, with the ribbon in an unexpanded state. The example of a typical partially-bonded ribbon is illustrated in Figure 3.

[a] Dimensions for other ribbons with fibre counts not listed above should be established between the customer and supplier.

[b] Per unit values are measured with the ribbon separated into the intended sub-units.

[c] The maximum height of 380 µm can be used in case the optical fibre ribbon can be separated into sub-units.

Table 2 – Maximum dimensions of optical fibre ribbons for typical 200 µm coating diameter fibre

Number of fibres[a]	Width	Height		
			Extreme fibres	Planarity
	w	*h*	*b*	*p*
	µm	µm	µm	µm
4	1 130	325	685	50
6	1 570	325	1 142	50
8	2 010	325	1 598	50
8	TBD	TBD	Per 4f unit[c]	Per 4f unit[c]
12	2 890	325	2512	75
16	3 770	325	3425	100
16	TBD	TBD	Per 8f unit[c]	Per 8f unit[c]
24[b]	TBD	TBD	TBD	TBD
32[b]	TBD	TBD	TBD	TBD
36[b]	TBD	TBD	TBD	TBD

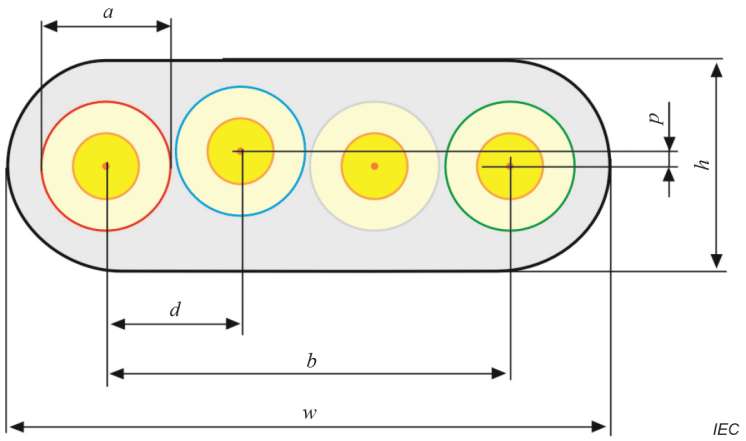
If the ribbon has flexibility, for example in the case of having a partially-bonded configuration, the dimensions of the ribbon should be measured under the condition in which the tested ribbon is configured in such a way where all the individual fibres are aligned in approximately the same plane across the ribbon width, with the ribbon in an unexpanded state. The example of a typical partially-bonded ribbon is illustrated in Figure 3.

For optical fibre ribbons for a typical 200 µm coating diameter fibre where neighbouring fibres are not in contact with each other as illustrated in Figure 1 and Figure 2 (upper figure), or in partially-bonded structure as illustrated in Figure 3, a greater value can be agreed between manufacturer and user. Even in that case, the maximum width (w) and extreme fibres (b) should not exceed those of optical fibre ribbon for typical 250 µm coating diameter fibre as shown in Table 1.

[a] Dimensions for other ribbons with fibre counts not listed above should be established between the customer and supplier.

[b] For these fibre counts, the optical fibre ribbon can be separated into sub-units if designed to do so.

[c] Per unit values are measured with the ribbon separated into the intended sub-units.



Key

a diameter of a coloured fibre

w width of that area

h height of that area

d distance between adjacent fibres

b distance between the extreme fibres

p planarity of the ribbon which is defined as the sum of the absolute values of the maximum positive and maximum negative vertical separation from the basis line

In consideration of the precision of fibre geometric attributes and the relatively larger precision of ribbon geometry requirements, it is acceptable for glass core/glass cladding fibres to use the edge of the cladding for the measurements according to Table 1 and Table 2, as illustrated in Figure 4, in lieu of the fibre centres. In this case, the measurements shall be made on the same side of all fibres (e.g. top or bottom, left or right side). This is consistent with IEC 60794-1-23, method G2.

NOTE The maximum dimensions and the structural geometry of optical fibre ribbons for 24 or more typical 200 µm coating diameter fibres are currently under study.

Figure 4 – Example of cross-sectional drawing illustrating fibre ribbon geometry (four-fibre ribbon)

More stringent requirements may be agreed between the customer and supplier, as needed, depending on the splice or the connector technique employed.

The dimensions and structural geometry can be verified with a type test, described as the visual measurement method (IEC 60794-1-23, method G2) to establish and ensure proper control of the ribbon manufacturing process. Once the process is established, and in order to ensure functional performance, the width and height of the ribbons may be controlled and verified, for final inspection purposes, with an aperture gauge (IEC 60794-1-23, method G3) or by the visual measurement method.

4.4 Mechanical requirements

4.4.1 General

The optical fibre ribbon shall satisfy the specifications and be tested as indicated in 4.4.2 and 4.4.4.

Detailed specifications of an optical fibre ribbon shall be verified by application, such as indoor and outdoor use, and are described in the sectional specifications for optical cables.

4.4.2 Separability of individual fibres from a ribbon

Fibre breakout capability at some level is generally required. Some ribbons of any type can be separated into predefined units. Specific requirements for breakout and separability shall be as specified in the detail specifications.

The ribbons shall be constructed in such a way that fibres can be separated from the ribbon construction, and formed into sub-units or individual optical fibres, as specified in the detail specification, while meeting the following criteria:

- the ribbon shall be tested for the ability to break out individual fibres using the tear (separability) test shown in IEC 60794-1-23, method G5, or a method agreed upon between the customer and supplier;
- the end breakout shall be accomplished without specialized tools or apparatus;
- the mid-span breakout shall be accomplished following the ribbon manufacturer's procedures;
- the fibre breakout procedure shall not be permanently detrimental to the optical and mechanical performance of the fibre;
- any colour coding of fibres shall remain sufficiently intact within any 25 mm segment to enable individual fibres to be distinguished from each other.

4.4.3 Ribbon stripping

The coating of individual fibres as well as the residual ribbon bonding material shall be easily removable by an adequate stripping method, preferably thermal stripping. The ribbon bonding materials and primary coating layers should be removed as a "strip" to avoid excess dust generation. The method of removal shall be agreed between the customer and supplier or shall be defined in the detail specification.

4.4.4 Torsion

The mechanical and functional integrity of a fibre ribbon can be verified by carrying out the torsion test shown in IEC 60794-1-23, method G6.

4.5 Identification of the ribbon

Each fibre within a ribbon cable shall be uniquely identifiable using some scheme of ribbon identification and fibre identification within a ribbon. Common schemes include ribbon coding by printed legends, ribbon positioning (tubes, slots, etc.), fibre positional colour coding, colour coded matrix, and fibre colour coding within a ribbon. Fibres within each ribbon shall be identified by an agreed colour coding scheme or positional scheme. Examples of the colour coding scheme and positional scheme are described in Annex A. Specific colour order is not defined in IEC cable specifications due to regional differences. The guidance regarding the colour coding scheme is given in IEC TR 61394. The scheme shall be defined in the detail specification.

Annex A
(informative)

Fibre identification

A.1 Identification by positional identification

If positional identification is specified, the scheme may follow the scheme described below and illustrated in Figure A.1. The fibre should be distinguishable by means of colour coding and positioning. For example (see Figure A.1):

a) a fibre ribbon has an identification coloured fibre on one side of the ribbon and a sub-identification coloured one on the other side or has two identification coloured fibres on one side. Sub-identification colour code can be used when the optical fibre ribbons are larger in number than the identification colour code;

b) any colour of the identification fibre colours group is different from that of the sub-identification fibre colours group. The side of the identification colours group corresponds to fibre no. 1 in the ribbon;

c) the colour types and the order used for identification and sub-identification should be agreed between the customer and the supplier. The colours of the other fibres should be agreed between the customer and the supplier;

d) the colour range used is as described in IEC 60304. The specific colour order is not defined in IEC cable specifications due to regional differences. The guidance will be described in IEC TR 63194 for colour coding scheme.

NOTE 1 The identification colour enables each fibre ribbon to be identified individually within a group of ribbons.

NOTE 2 The sub-identification colour shows the ribbon group.

NOTE 3 The identification and the sub-identification colour in a ribbon enables each fibre to be identified individually within the ribbon.

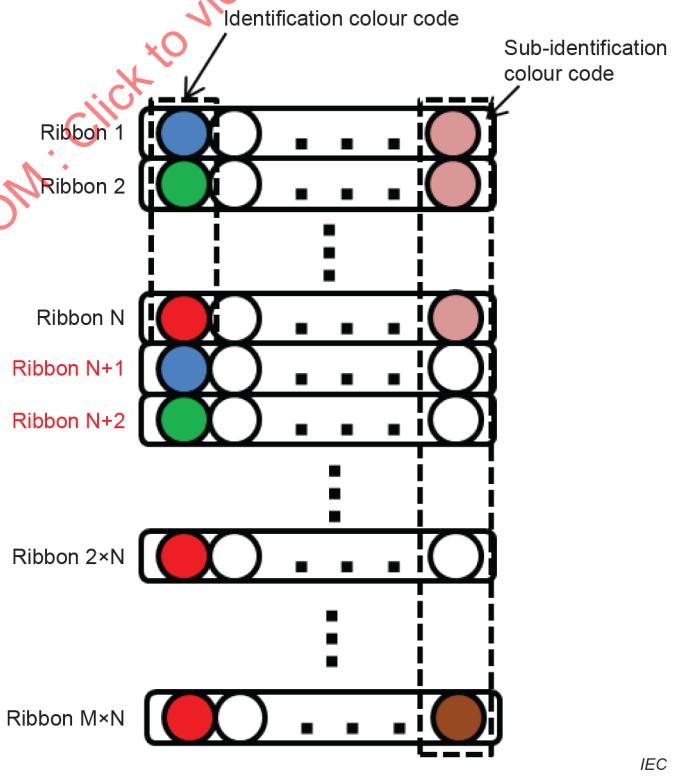


Figure A.1 – Example of identification by means of colour coding and positioning

A.2 Identification by ribbon coding and fibre colouring

Ribbon coding may use printed legends establishing the ribbon number, directly. This can be accomplished by numbering, colour abbreviations corresponding to the agreed coding scheme, blocks or hachures, or other methods meeting this intent.

Fibres within each ribbon should be identified by an agreed colour coding scheme or positional scheme as in Clause A.1. Specific colour order is not defined in IEC cable specifications due to regional differences. The guidance regarding the colour coding scheme is given in IEC TR 63194.

Bibliography

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

IEC TR 63194, *Guidance for colour coding of optical fibre cables*

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SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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CÂBLES À FIBRES OPTIQUES –

Partie 1-31: Spécification générique – Éléments de câbles optiques – Rubans de fibres optiques

AVANT-PROPOS

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L'IEC 60794-1-31 a été établie par le sous-comité SC86A: Fibres et câbles, du comité d'études 86 de l'IEC: Fibres optiques. Il s'agit d'une Norme internationale.

Cette seconde édition annule et remplace la première édition, publiée en 2018. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) Les exigences géométriques pour les rubans de fibres optiques ayant généralement un diamètre de revêtement de 250 µm ont été modifiées et celles pour le ruban de fibres optiques ayant généralement un diamètre de revêtement de 200 µm ont été ajoutées.

b) Les paragraphes "Identification selon le positionnement" et "Identification par codage du ruban et coloration des fibres" ont été déplacés dans une nouvelle Annexe A informative.

Le texte de cette Norme internationale est issu des documents suivants:

CDV	Rapport de vote
86A/2071/CDV	86A/2109/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Une liste de toutes les parties de la série IEC 60794, publiées sous le titre général *Câbles à fibres optiques*, peut être consultée sur le site web de l'IEC.

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CÂBLES À FIBRES OPTIQUES –

Partie 1-31: Spécification générique – Éléments de câbles optiques – Rubans de fibres optiques

1 Domaine d'application

La présente partie de l'IEC 60794, qui est une spécification générique, s'applique aux rubans de fibres optiques. Les exigences qui sont décrites dans la présente partie s'appliquent aux câbles à rubans de fibres optiques destinés à être utilisés dans les équipements de télécommunications et les dispositifs utilisant des techniques analogues, en particulier les câbles à fibres optiques de l'IEC 60794-2 pour une utilisation à l'intérieur, de l'IEC 60794-3 pour une utilisation à l'extérieur, de l'IEC 60794-4 pour une utilisation aérienne autoporteuse, de l'IEC 60794-5 pour une utilisation soufflée et de l'IEC 60794-6 pour une utilisation à l'extérieur/l'intérieur. La spécification particulière peut être vérifiée dans les spécifications pour chaque application comme l'IEC 60794-2 et l'IEC 60794-3.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60793-2-10, *Fibres optiques – Partie 2-10: Spécifications de produits – Spécification intermédiaire pour les fibres multimodales de catégorie A1*

IEC 60793-2-50, *Fibres optiques – Partie 2-50: Spécifications de produits – Spécification intermédiaire pour les fibres unimodales de classe B*

IEC 60794-1-1, *Câbles à fibres optiques – Partie 1-1: Spécification générique – Généralités*

IEC 60794-1-23, *Câbles à fibres optiques – Partie 1-23: Spécification générique – Procédures fondamentales d'essai des câbles optiques – Méthodes d'essai des éléments de câble*

IEC 60794-2, *Câbles à fibres optiques – Partie 2: Câbles intérieurs – Spécification intermédiaire*

IEC 60794-3, *Câbles à fibres optiques – Partie 3: Câbles extérieurs – Spécification intermédiaire*

IEC 60794-4, *Câbles à fibres optiques – Partie 4: Spécification intermédiaire – Câbles optiques aériens le long des lignes électriques de transport d'énergie*

IEC 60794-5, *Câbles à fibres optiques – Partie 5: Spécification intermédiaire – Câblage en micro-conduits pour installation par soufflage*

IEC 60794-6, *Câbles à fibres optiques – Partie 6: Câbles intérieurs/extérieurs – Spécification intermédiaire pour les câbles intérieurs/extérieurs*

3 Termes, définitions, symboles et abréviations

Pour les besoins du présent document, les termes, définitions, symboles et abréviations donnés dans l'IEC 60794-1-1 s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes :

- IEC Electropedia : disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform : disponible à l'adresse http://www.iso.org/obp

4 Exigences

4.1 Généralités

Les rubans de fibres optiques sont constitués de fibres optiques qui peuvent être assemblées en un arrangement linéaire composite.

Les fibres doivent être disposées en parallèle et former des rubans généralement constitués de quatre, six, huit, douze, seize, vingt-quatre, trente-deux ou trente-six fibres chacun, conformément aux exigences de l'utilisateur, et doivent pouvoir être soumises à une épissure de masse.

Certains paramètres doivent être mesurés sur le ruban, les essais correspondants effectués sur la fibre sous revêtement primaire ou sur le câble terminé n'étant pas suffisants pour avoir une caractérisation complète. Ces paramètres sont identifiés ci-dessous.

4.2 Construction

4.2.1 Structure en ruban

Les structures en ruban sont généralement désignées comme étant collées bord à bord, encapsulées ou collées partiellement. Les structures collées bord à bord et encapsulées se différencient par la quantité de revêtement protecteur fourni aux fibres par l'adhésif. Le ruban collé partiellement peut présenter l'une ou l'autre structure, mais avec le revêtement protecteur appliqué périodiquement.

La Figure 1 représente la structure collée bord à bord, dans laquelle l'adhésif est appliqué principalement entre les fibres. La Figure 2 représente la structure encapsulée, dans laquelle l'adhésif s'étend bien au-delà de la surface extérieure des fibres. La Figure 3 représente la structure collée partiellement, dans laquelle les fibres voisines sont assemblées périodiquement dans le sens longitudinal.

Les rubans collés bord à bord et encapsulés sont principalement rigides dans le sens transversal. La structure collée partiellement permet au ruban de fibres optiques d'être enroulé facilement et de s'insérer parfaitement dans les câbles.