IEC 60793-1-46

Edition 2.0 2024-06
COMMENTED VERSION

INTERNATIONAL STANDARD

colour inside

Optical fibres –
Part 1-46: Measurement methods and test procedures – Monitoring of changes in attenuation

INTERNATIONAL
ELECTROTECHNICAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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OPTICAL FIBRES –

Part 1-46: Measurement methods and test procedures – Monitoring of changes in ~~optical transmittance~~ attenuation

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.
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9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

This commented version (CMV) of the official standard IEC 60793-1-46:2024 edition 2.0 allows the user to identify the changes made to the previous IEC 60793-1-46:2001 edition 1.0. Furthermore, comments from IEC SC 86A experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 60793-1-46 has been prepared by subcommittee 86A: 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 2001. This edition constitutes a technical revision.

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

a) inclusion of class C single mode intraconnection fibre;
b) replacement of 'optical transmittance' by 'attenuation'.

The text of this International Standard is based on the following documents:

Draft	Report on voting
86A/2442/FDIS	86A/2475/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

IEC 60793-1-1 and IEC 60793-1-2 cover generic specifications.

IEC 60793-1-4X consists of the following parts, under the general title: *Optical fibres*:

– *Part 1-40: Measurement methods and test procedures – Attenuation*
– *Part 1-41: Measurement methods and test procedures – Bandwidth*
– *Part 1-42: Measurement methods and test procedures – Chromatic dispersion*
– *Part 1-43: Measurement methods and test procedures – Numerical aperture*
– *Part 1-44: Measurement methods and test procedures – Cut-off wavelength*
– *Part 1-45: Measurement methods and test procedures – Mode field diameter*
– *Part 1-46: Measurement methods and test procedures – Monitoring of changes in attenuation*
– *Part 1-47: Measurement methods and test procedures – Macrobending loss*
– *Part 1-48: Measurement methods and test procedures – Polarization mode dispersion*
– *Part 1-49: Measurement methods and test procedures – Differential mode delay*

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

INTRODUCTION

Publications in the IEC 60793-1 series concern measurement methods and test procedures as they apply to optical fibres.

Within the same series several different areas are grouped, as follows:

- ~~parts 1-10 to 1-19: General~~
- IEC 60793-1-20 to IEC 60793-1-29: *Measurement methods and test procedures for dimensions*
- IEC 60793-1-30 to IEC 60793-1-39: *Measurement methods and test procedures for mechanical characteristics*
- IEC 60793-1-40 to IEC 60793-1-49: *Measurement methods and test procedures for transmission and optical characteristics*
- IEC 60793-1-50 to IEC 60793-1-59: *Measurement methods and test procedures for environmental characteristics*
- IEC 60793-1-60 to IEC 60793-1-69: *Measurement methods and test procedures for polarization-maintaining fibres*

OPTICAL FIBRES –

Part 1-46: Measurement methods and test procedures – Monitoring of changes in ~~optical transmittance~~ attenuation 1

1 Scope

This part of IEC 60793 establishes uniform requirements for the monitoring of changes in ~~optical transmittance~~ attenuation, thereby assisting in the inspection of fibres and cables for commercial purposes.

This document gives two methods for monitoring the changes in ~~optical transmittance~~ attenuation of optical fibres and cables that occur during mechanical or environmental testing, or both. It provides a monitor in the change of ~~optical transmission~~ attenuation characteristics arising from optical discontinuity, physical defects and modifications of the attenuation slope:

– method A: change in ~~transmittance~~ attenuation by transmitted power;
– method B: change in ~~transmittance~~ attenuation by backscattering.

Methods A and B apply to the monitoring of all categories of the following fibres:

– class A: multimode fibres;
– class B: single-mode fibres;
– class C: single-mode intraconnection fibres. 2

Information common to both measurements is contained in Clause 1 to Clause 10, and information pertaining to each individual method appears in Annex A, and Annex B respectively.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60793-1-40, *Optical fibres – Part 1-40: ~~Measurement methods and test procedures –~~ Attenuation measurement methods*

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INTERNATIONAL STANDARD

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Optical fibres –
Part 1-46: Measurement methods and test procedures – Monitoring of changes in attenuation

Fibres optiques –
Partie 1-46: Méthodes de mesure et procédures d'essai – Contrôle des variations de l'affaiblissement

IEC 60793-1-46:2024-06(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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OPTICAL FIBRES –

Part 1-46: Measurement methods and test procedures – Monitoring of changes in attenuation

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b) replacement of 'optical transmittance' by 'attenuation'.

The text of this International Standard is based on the following documents:

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IEC 60793-1-1 and IEC 60793-1-2 cover generic specifications.

IEC 60793-1-4X consists of the following parts, under the general title: *Optical fibres*:

– *Part 1-40: Measurement methods and test procedures – Attenuation*
– *Part 1-41: Measurement methods and test procedures – Bandwidth*
– *Part 1-42: Measurement methods and test procedures – Chromatic dispersion*
– *Part 1-43: Measurement methods and test procedures – Numerical aperture*
– *Part 1-44: Measurement methods and test procedures – Cut-off wavelength*
– *Part 1-45: Measurement methods and test procedures – Mode field diameter*
– *Part 1-46: Measurement methods and test procedures – Monitoring of changes in attenuation*
– *Part 1-47: Measurement methods and test procedures – Macrobending loss*
– *Part 1-48: Measurement methods and test procedures – Polarization mode dispersion*
– *Part 1-49: Measurement methods and test procedures – Differential mode delay*

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

Publications in the IEC 60793-1 series concern measurement methods and test procedures as they apply to optical fibres.

Within the same series several different areas are grouped, as follows:

– IEC 60793-1-20 to IEC 60793-1-29: *Measurement methods and test procedures for dimensions*

– IEC 60793-1-30 to IEC 60793-1-39: *Measurement methods and test procedures for mechanical characteristics*

– IEC 60793-1-40 to IEC 60793-1-49: *Measurement methods and test procedures for transmission and optical characteristics*

– IEC 60793-1-50 to IEC 60793-1-59: *Measurement methods and test procedures for environmental characteristics*

– IEC 60793-1-60 to IEC 60793-1-69: *Measurement methods and test procedures for polarization-maintaining fibres*

OPTICAL FIBRES –

Part 1-46: Measurement methods and test procedures – Monitoring of changes in attenuation

1 Scope

This part of IEC 60793 establishes uniform requirements for the monitoring of changes in attenuation, thereby assisting in the inspection of fibres and cables for commercial purposes.

This document gives two methods for monitoring the changes in attenuation of optical fibres and cables that occur during mechanical or environmental testing, or both. It provides a monitor in the change of attenuation characteristics arising from optical discontinuity, physical defects and modifications of the attenuation slope:

– method A: change in attenuation by transmitted power;
– method B: change in attenuation by backscattering.

Methods A and B apply to the monitoring of all categories of the following fibres:

– class A: multimode fibres;
– class B: single-mode fibres;
– class C: single-mode intraconnection fibres.

Information common to both measurements is contained in Clause 1 to Clause 10, and information pertaining to each individual method appears in Annex A, and Annex B respectively.

2 Normative references

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IEC 60793-1-40, *Optical fibres – Part 1-40: Attenuation measurement methods*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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FIBRES OPTIQUES –

Partie 1-46: Méthodes de mesure et procédures d'essai – Contrôle des variations de l'affaiblissement

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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L'IEC 60793-1-46 a été établie par le sous-comité 86A: 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 parue en 2001. Cette édition constitue une révision technique.

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

a) ajout de la fibre d'intraconnexion unimodale de classe C;
b) remplacement de l'expression "facteur de transmission optique" par "affaiblissement".

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

Projet	Rapport de vote
86A/2442/FDIS	86A/2475/RVD

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/publications.

L'IEC 60793-1-1 et l'IEC 60793-1-2 couvrent les spécifications génériques.

L'IEC 60793-1-4X comprend les parties suivantes présentées sous le titre général: *Fibres optiques*:

– *Partie 1-40: Méthodes de mesurage de l'affaiblissement*
– *Partie 1-41: Méthodes de mesure et procédures d'essai – Largeur de bande*
– *Partie 1-42: Méthodes de mesure et procédures d'essai – Dispersion chromatique*
– *Partie 1-43: Méthodes de mesure et procédures d'essai – Mesure de l'ouverture numérique*
– *Partie 1-44: Méthodes de mesure et procédures d'essai – Longueur d'onde de coupure*
– *Partie 1-45: Méthodes de mesure et procédures d'essai – Diamètre du champ de mode*
– *Partie 1-46: Méthodes de mesure et procédures d'essai – Contrôle des variations du facteur de transmission optique*
– *Partie 1-47: Méthodes de mesure et procédures d'essai – Pertes par macrocourbures*
– *Partie 1-48: Méthodes de mesure et procédures d'essai – Dispersion de mode de polarisation*
– *Partie 1-49: Méthodes de mesure et procédures d'essai – Retard différentiel de mode*

Une liste de toutes les parties de la série IEC 60793, publiées sous le titre général *Fibres optiques*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

INTRODUCTION

Les publications de la série IEC 60793-1 concernent les méthodes de mesure et les procédures d'essai qui s'appliquent aux fibres optiques.

Cette même série traite des différents domaines regroupés de la façon suivante:

– IEC 60793-1-20 à IEC 60793-1-29: *Méthodes de mesure et procédures d'essai pour les dimensions*

– IEC 60793-1-30 à IEC 60793-1-39: *Méthodes de mesure et procédures d'essai pour les caractéristiques mécaniques*

– IEC 60793-1-40 à IEC 60793-1-49: *Méthodes de mesure et procédures d'essai pour les caractéristiques optiques et de transmission*

– IEC 60793-1-50 à IEC 60793-1-59: *Méthodes de mesure et procédures d'essai pour les caractéristiques environnementales*

– IEC 60793-1-60 à IEC 60793-1-69: *Méthodes de mesure et procédures d'essai pour les fibres à maintien de polarisation*

FIBRES OPTIQUES –

Partie 1-46: Méthodes de mesure et procédures d'essai – Contrôle des variations de l'affaiblissement

1 Domaine d'application

La présente partie de l'IEC 60793 établit des exigences uniformes pour le contrôle des variations de l'affaiblissement, contribuant ainsi au contrôle des fibres et câbles dans le cadre des relations commerciales.

Le présent document décrit deux méthodes pour contrôler les variations de l'affaiblissement des fibres optiques et des câbles qui se produisent au cours des essais mécaniques et d'environnement, ou des deux. Il fournit un moyen de contrôle de la variation des caractéristiques d'affaiblissement qui proviennent de la discontinuité optique, de défauts physiques et de modifications de la pente d'affaiblissement:

– Méthode A: variation de l'affaiblissement en puissance transmise;
– Méthode B : variation de l'affaiblissement en rétrodiffusion.

Les méthodes A et B s'appliquent au contrôle de toutes les catégories de fibres suivantes:

– Classe A: fibres multimodales;
– Classe B: fibres unimodales;
– Classe C: fibres d'intraconnexion unimodales.

Les informations communes aux deux mesures sont contenues dans les Articles 1 à 10 et les informations relatives à chacune des méthodes se trouvent respectivement dans les Annexe A et Annexe B.

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 et sont indispensables pour son application. 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 60793-1-40, *Fibres optiques – Partie 1-40: Méthodes de mesurage de l'affaiblissement*