



**SLOVENSKI STANDARD**  
**SIST EN 60793-1-60:2017**  
**01-julij-2017**

---

**Optična vlakna - 1-60. del: Metode merjenja in preskusni postopki - Dolžina udarca (IEC 60793-1-60:2017)**

Optical fibres - Part 1-60: Measurement methods and test procedures - Beat length (IEC 60793-1-60:2017)

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

Ta slovenski standard je istoveten z: **EN 60793-1-60:2017**  
<https://standards.iteh.ai/catalog/standards/sist/20a2c7ed-5661-4586-a769-81a1d30a35ec/sist-en-60793-1-60-2017>

---

**ICS:**

33.180.10      (Optična) vlakna in kabli      Fibres and cables

**SIST EN 60793-1-60:2017**      **en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 60793-1-60:2017

<https://standards.iteh.ai/catalog/standards/sist/20a2c7ed-56b1-4386-a769-81a1d30a35ec/sist-en-60793-1-60-2017>

EUROPEAN STANDARD

**EN 60793-1-60**

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2017

ICS 33.180.10

English Version

**Optical fibres - Part 1-60: Measurement methods and test procedures - Beat length  
(IEC 60793-1-60:2017)**

Fibres optiques - Partie 1-60: Méthodes de mesure et procédures d'essai - Longueur de battement  
(IEC 60793-1-60:2017)

Lichtwellenleiter - Teil 1-60: Messmethoden und Prüfverfahren - Schwebungslänge  
(IEC 60793-1-60:2017)

This European Standard was approved by CENELEC on 2017-03-14. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

**EN 60793-1-60:2017****European foreword**

The text of document 86A/1737/CDV, future edition 1 of IEC 60793-1-60, prepared by SC 86A "Fibres and cables" of IEC/TC 86 "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60793-1-60:2017.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-12-14
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2020-03-14

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

**iTeh STANDARD PREVIEW**  
**Endorsement notice**  
**(standards.iteh.ai)**

The text of the International Standard IEC 60793-1-60:2017 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated :

IEC 60793-2	NOTE	Harmonized as EN 60793-2.
-------------	------	---------------------------

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-1	-	Environmental testing - Part 1: General and guidance	EN 60068-1	-
IEC 60793-1-1	-	Optical fibres - Part 1-1: Measurement methods and test procedures - General and guidance	EN 60793-1-1	-
IEC 60793-1-48	-	Optical fibres - Part 1-48: Measurement methods and test procedures - Polarization mode dispersion	EN 60793-1-48	-
IEC 60793-2-70	-	Optical fibres - Part 2-70: Product specifications - Sectional specification for polarization-maintaining fibres	EN 60793-2-70	-

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN 60793-1-60:2017](#)

<https://standards.iteh.ai/catalog/standards/sist/20a2c7ed-56b1-4386-a769-81a1d30a35ec/sist-en-60793-1-60-2017>



# INTERNATIONAL STANDARD



---

Optical fibres – **iTeh STANDARD PREVIEW**  
Part 1-60: Measurement methods and test procedures – Beat length  
(standards.iteh.ai)

[SIST EN 60793-1-60:2017](https://standards.iteh.ai/catalog/standards/sist/20a2c7ed-56b1-4386-a769-81a1d30a35ec/sist-en-60793-1-60-2017)

<https://standards.iteh.ai/catalog/standards/sist/20a2c7ed-56b1-4386-a769-81a1d30a35ec/sist-en-60793-1-60-2017>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 33.180.10

ISBN 978-2-8322-3865-3

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

## CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references .....	5
3 Terms and definitions .....	5
4 Testing conditions .....	6
5 Reference test method .....	6
6 Specimen .....	6
7 Test methods.....	6
7.1 Phase beat length measurement methods.....	6
7.1.1 General .....	6
7.1.2 Monitoring of output power using an electromagnet .....	6
7.1.3 Monitoring of SOP using a lateral force.....	8
7.2 Group beat length measurement method.....	10
7.2.1 General .....	10
7.2.2 Apparatus and procedure.....	10
7.2.3 Calculation .....	11
8 Results.....	11
8.1 Information available with each measurement.....	11
8.2 Information available upon request .....	12
Annex A (informative) Difference of beat lengths by measurement method (phase beat length and group beat length) .....	13
A.1 Phase modal birefringence and phase beat length .....	13
A.2 Group modal birefringence and group beat length.....	13
Annex B (informative) Correlation between results obtained by the two methods (phase beat length and group beat length).....	16
B.1 General.....	16
B.2 Example of correlation between phase and group beat lengths in the case of PANDA fibres.....	16
B.3 Example of correlation between phase and group beat lengths in the case of elliptical core fibres.....	17
Annex C (informative) Electromagnet for Faraday rotation .....	18
Bibliography.....	19
Figure 1 – Apparatus of phase beat length measurement using an electromagnet .....	6
Figure 2 – Example of measurement profile by electromagnet .....	8
Figure 3 – Set-up for measuring $L_B(\text{phase})$ when monitoring SOP together with a moving lateral force .....	9
Figure 4 – SOP measured at different levels of lateral force.....	10
Figure 5 – Example of SOP evolution and normalized Stokes vector components .....	10
Figure B.1 – Wavelength dependence of $B_{\text{group}}/B_{\text{phase}}$ [3] .....	16
Figure C.1 – Schematic of the electromagnet.....	18
Table B.1 – $B_{\text{group}}/B_{\text{phase}}$ of elliptical core fibres.....	17



## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## OPTICAL FIBRES –

**Part 1-60: Measurement methods and test procedures –  
Beat length**

## 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.  
<https://standards.iteh.ai/catalog/standards/sist/20a2c7ed-56b1-4386-a769->
- 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 60793-1-60 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

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

CDV	Report on voting
86A/1737/CDV	86A/1782/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document 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.**

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 60793-1-60:2017](https://standards.iteh.ai/catalog/standards/sist/20a2c7ed-56b1-4386-a769-81a1d30a35ec/sist-en-60793-1-60-2017)

<https://standards.iteh.ai/catalog/standards/sist/20a2c7ed-56b1-4386-a769-81a1d30a35ec/sist-en-60793-1-60-2017>

## OPTICAL FIBRES –

### Part 1-60: Measurement methods and test procedures – Beat length

#### 1 Scope

This part of IEC 60793 defines test methods for both the phase beat length, and the group beat length. These two parameters are defined differently, and will give different results depending on the type of polarization-maintaining (PM) fibre.

The phase beat length is the relevant parameter for the fibres ability to maintain a high extinction ratio. This is described in more details in Annexes A and B.

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

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

IEC 60793-1-48, *Optical fibres – Part 1-48: Measurement methods and test procedures – Polarization mode dispersion*

IEC 60793-2-70<sup>1</sup>, *Optical fibres – Part 2-70: Product specifications – Sectional specifications for polarization-maintaining fibres*

#### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60793-1-1 and the following apply.

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>

##### 3.1 phase beat length

$L_{B(\text{phase})}$

distance over which two orthogonal polarization modes are delayed by one cycle ( $2\pi$ )

##### 3.2 group beat length

$L_{B(\text{group})}$

distance over which the group delay difference is one cycle ( $2\pi$ )

Note 1 to entry A group delay is based on group refractive index.

<sup>1</sup> Under preparation. Stage at the time of publication: IEC CCDV 60793-2-70:2017.