



BSI Standards Publication

## Optical fibres

Part 1-52: Measurement methods  
and test procedures — Change of  
temperature tests

**National foreword**

This British Standard is the UK implementation of EN 60793-1-52:2014. It is identical to IEC 60793-1-52:2014. It supersedes BS EN 60793-1-52:2002 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GEL/86, Fibre optics, to Subcommittee GEL/86/1, Optical fibres and cables.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014

Published by BSI Standards Limited 2014

ISBN 978 0 580 82235 3

ICS 33.180.10

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2014.

**Amendments issued since publication**

<b>Amd. No.</b>	<b>Date</b>	<b>Text affected</b>
-----------------	-------------	----------------------

---

EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 60793-1-52**

May 2014

ICS 33.180.10

Supersedes EN 60793-1-52:2002

English Version

**Optical fibres - Part 1-52: Measurement methods and test  
procedures - Change of temperature tests  
(IEC 60793-1-52:2014)**

Fibres optiques - Partie 1-52: Méthodes de mesure et  
procédures d'essai - Essais de variations de température  
(CEI 60793-1-52:2014)

Lichtwellenleiter - Teil 1-52: Messmethoden und  
Prüfverfahren - Temperaturwechsel  
(IEC 60793-1-52:2014)

This European Standard was approved by CENELEC on 2014-03-12. 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, 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**

## Foreword

The text of document 86A/1528/CDV, future edition 2 of IEC 60793-1-52, 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 60793-1-52:2014.

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) 2014-12-12
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-03-12

This document supersedes EN 60793-1-52:2002.

EN 60793-1-52 includes the following significant technical changes with respect to EN 60793-1-52:2002:

- a) Harmonizing the content with sectional specifications of relevant fibre types;
- b) Extending the applicability of the document to class C single-mode fibres.

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

## Endorsement notice

The text of the International Standard IEC 60793-1-52:2014 was approved by CENELEC as a European Standard without any modification.

## 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 60068-2-14	-	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	-
IEC 60793-1-40 (mod)	2001	Optical fibres - Part 1-40: Measurement methods and test procedures - Attenuation	EN 60793-1-40	2003
IEC 60793-2-10	-	Optical fibres - Part 2-10: Product specifications - Sectional specification for category A1 multimode fibres	EN 60793-2-10	-
IEC 60793-2-50	-	Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres	EN 60793-2-50	-
IEC 60793-2-60	-	Optical fibres - Part 2-60: Product specifications - Sectional specification for category C single-mode intraconnection fibres	EN 60793-2-60	-

## CONTENTS

1	Scope .....	5
2	Normative references .....	5
3	Apparatus .....	5
3.1	Chamber .....	5
3.2	Other apparatus .....	5
4	Sampling and specimens .....	6
5	Procedure .....	6
5.1	General .....	6
5.2	Optical measurements .....	6
5.3	Conditioning .....	6
5.4	Recovery .....	7
6	Pass/fail criteria .....	7
7	Results .....	7
7.1	Information to be provided with each test .....	7
7.2	Information to be available upon request .....	7
8	Specification information .....	7

## OPTICAL FIBRES –

### Part 1-52: Measurement methods and test procedures – Change of temperature tests

#### 1 Scope

This part of IEC 60793 provides a practical method for evaluating fibre performance in a defined environment.

The purpose of this standard is to define a test that determines the suitability of sub-category A1a to A1d multimode fibres and class B and C single-mode fibres to withstand the environmental condition of change in temperature which may occur in actual use, storage and/or transport. The test is primarily intended to permit the observation of effects of change of temperature over a given period. This procedure is conducted in accordance with IEC 60068-2-14, Test Nb.

NOTE The applicability of this test to other fibre categories is under study.

#### 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 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60793-1-40:2001, *Optical fibres – Part 1-40: Attenuation measurement methods*

IEC 60793-2-10, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60793-2-60, *Optical fibres – Part 2-60: Product specifications – Sectional specification for class C single-mode intraconnection fibres*

#### 3 Apparatus

##### 3.1 Chamber

The apparatus consists of an environmental chamber in accordance with IEC 60068-2-14, Test Nb. The chamber shall be capable of housing the specimen and of allowing measurement during conditioning. It shall also be capable of maintaining the specified temperatures within the specified tolerances. Forced air circulation may be used to maintain homogeneous conditions. The chamber and accessories shall be constructed and arranged in such a manner as to avoid condensation dripping on the specimen.

##### 3.2 Other apparatus

Additional apparatus may be necessary to perform the examinations and measurements (or as specified in the detail specification).

## 4 Sampling and specimens

To ensure the required repeatability on optical measurements, the length of the specimen shall be at least 1 000 m for fibre sub-categories A1a to A1d, and at least 2 000 m for fibre class B and C. The amount of the specimen outside of the test chamber shall be minimized, and if it exceeds 10 % of the overall specimen length, this should be reported.

The preparation of the specimen shall have no detrimental effect on the fibre whilst under test conditions. Unless otherwise specified, the fibre sample should be loosely coiled and dusted with a material such as talcum powder, to allow the coils to move freely against each other. The specimen may be coiled horizontally or vertically, with a minimum bend diameter of 150 mm to avoid any macrobend effects.

A control length of the specimen shall be removed prior to the test to enable the completion of required mechanical measurements for comparison to measurements made after the test. This control length should not be dusted.

## 5 Procedure

### 5.1 General

The specimen is placed in a chamber and subjected to changes in temperature for a specified duration, as specified in the detail specification. Conduct the procedure in accordance with IEC 60068-2-14, Test Nb, with the following conditions:

Description	IEC 60068-2-14 nomenclature	Nominal values
Pre-conditioning	Pre-conditioning	2 h at 23 °C/50 % RH
Minimum temperature	TA	–60 °C (see note 1)
Maximum temperature	TB	+85 °C (see note 2)
Minimum dwell time at each temperature	t1	2 h
Maximum speed at which to change the temperature	Ramp rate	1 °C/min
Number of complete cycles required	Number of cycles	2
NOTE 1 In some regions, –40 °C may be acceptable.		
NOTE 2 In some regions, +70 °C may be acceptable.		

### 5.2 Optical measurements

Attenuation measurement shall be carried out at the wavelengths specified in the relevant specification using either IEC 60793-1-40:2001, Annex B (insertion loss) or IEC 60793-1-40:2001, Annex C (backscattering) before, during (once the specimen has stabilized at the specified temperature) and after the test. Attenuation changes shall be recorded.

Other optical measurements may be required if specified in the relevant product specification.

### 5.3 Conditioning

Stabilize the chamber and the specimen to standard atmospheric conditions prior to the reference measurements being taken.

Adjust the chamber temperature and humidity to the specified severity. The maximum rate of change of temperature shall be 1 °C/min, averaged over a maximum period of 5 min. Allow the specimen to reach temperature stability and maintain the temperature and humidity for the duration specified.



At the completion of the test, allow the specimen to remain in the chamber while the temperature is reduced to standard atmospheric conditions. The maximum rate of change of temperature shall be 1 °C/min, averaged over a maximum period of 5 min. The detail specification may call for measurements during conditioning. If required, the detail specification shall specify the measurements to be taken and when to take them. Do not remove the specimen(s) from the chamber whilst these measurements are being made.

#### **5.4 Recovery**

Unless otherwise required by the relevant specification, the specimen shall remain under standard atmospheric condition for recovery for a period greater than 1 h but not more than 24 h. The detail specification may call for measurements during recovery. If required, the detail specification shall specify the measurements to be taken and when to take them.

### **6 Pass/fail criteria**

The applicable specification limits can be found in the relevant sectional specification of IEC 60793-2-10 for A1 fibres, IEC 60793-2-50 for B fibres and IEC 60793-2-60 for C fibres.

### **7 Results**

#### **7.1 Information to be provided with each test**

- date and title of test;
- identification of specimen;
- length of specimen;
- nominal wavelength(s) at which the test was performed;
- attenuation change.

#### **7.2 Information to be available upon request**

- description of all key equipment;
- temperature cycle details.

### **8 Specification information**

The detail specification shall specify the following information:

- values of  $T_A$  and  $T_B$  used;
  - pass/fail criteria;
  - information to be reported;
  - any deviations to the procedure that apply.
-





# British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

## About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

## Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at [bsigroup.com/standards](http://bsigroup.com/standards) or contacting our Customer Services team or Knowledge Centre.

## Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at [bsigroup.com/shop](http://bsigroup.com/shop), where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

## Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to [bsigroup.com/subscriptions](http://bsigroup.com/subscriptions).

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

**PLUS** is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit [bsigroup.com/shop](http://bsigroup.com/shop).

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email [bsmusales@bsigroup.com](mailto:bsmusales@bsigroup.com).

## BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

## Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

## Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

## Useful Contacts:

### Customer Services

**Tel:** +44 845 086 9001

**Email (orders):** [orders@bsigroup.com](mailto:orders@bsigroup.com)

**Email (enquiries):** [cservices@bsigroup.com](mailto:cservices@bsigroup.com)

### Subscriptions

**Tel:** +44 845 086 9001

**Email:** [subscriptions@bsigroup.com](mailto:subscriptions@bsigroup.com)

### Knowledge Centre

**Tel:** +44 20 8996 7004

**Email:** [knowledgecentre@bsigroup.com](mailto:knowledgecentre@bsigroup.com)

### Copyright & Licensing

**Tel:** +44 20 8996 7070

**Email:** [copyright@bsigroup.com](mailto:copyright@bsigroup.com)



...making excellence a habit.™