



BSI Standards Publication

## Optical fibres

Part 1-53: Measurement methods  
and test procedures — Water  
immersion tests

### **National foreword**

This British Standard is the UK implementation of EN 60793-1-53:2014. It is identical to IEC 60793-1-53:2014. It supersedes BS EN 60793-1-53:2002 which is withdrawn.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.

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English Version

**Optical fibres - Part 1-53: Measurement methods and test  
procedures - Water immersion tests  
(IEC 60793-1-53:2014)**

Fibres optiques - Partie 1-53: Méthodes de mesure et  
procédures d'essai - Essais d'immersion dans l'eau  
(CEI 60793-1-53:2014)

Lichtwellenleiter - Teil 1-53: Messmethoden und  
Prüfverfahren - Eintauchen in Wasser  
(IEC 60793-1-53:2014)

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Europäisches Komitee für Elektrotechnische Normung

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## Foreword

The text of document 86A/1529/CDV, future edition 2 of IEC 60793-1-53, 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 60793-1-53:2014.

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- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-03-12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 60793-1-53:2002.

EN 60793-1-53 includes the following significant technical changes with respect to EN 60793-1-53:2002:

- a) Harmonizing the content with sectional specifications of relevant fibre types;
- b) Extending the applicability of the standard 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.

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The text of the International Standard IEC 60793-1-53:2014 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 60068-2-18	-	Environmental testing - Part 2-18: Tests - Tests R and guidance: Water	EN 60068-2-18	-
IEC 60793-1-32	-	Optical fibres - Part 1-32: Measurement methods and test procedures - Coating strippability	EN 60793-1-32	-
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	-

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## OPTICAL FIBRES –

### Part 1-53: Measurement methods and test procedures – Water immersion 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 immersion in distilled or demineralized water which may occur in actual use, storage and/or transport. The test is primarily intended to permit the observation of effects of immersion in water over a given period. This procedure is conducted in accordance with IEC 60068-2-18, Test R.

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 60068-2-18, *Environmental testing – Part 2-18: Tests – Test R and guidance: Water*

IEC 60793-1-32, *Optical fibres – Part 1-32: Measurement and test procedures – Coating strippability*

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 Water tank

The apparatus consists of a water tank filled with water. Use distilled, demineralized or de-ionized water which has a pH of between 5,0 and 8,0.

##### 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 tank 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 that the fibre ends are kept out of the water. The specimen may be coiled horizontally or vertically, with a minimum bend diameter of 150 mm to avoid any macrobend effects.

A length of the control specimen shall be removed prior to the test to enable the completion of required mechanical measurements for comparison to measurements made after the test.

## 5 Procedure

### 5.1 General

The specimen is placed in a tank which is filled with water held at  $23\text{ °C} \pm 5\text{ °C}$ , and held there for 30 days. The attenuation and coating strip force of the specimen are then monitored. Conduct the procedure in accordance with IEC 60068-2-18, Test R, with the “head of water” being not applicable (the head of water is used to test for “water tightness” of electrotechnical products, but it is not required in this application).

### 5.2 Measurements

#### 5.2.1 Optical measurements

Attenuation measurement shall be carried out at the wavelength 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.

#### 5.2.2 Mechanical measurements

The fibre coating strip force shall be measured before and after the test, using the method described in IEC 60793-1-32. The control specimen (see Clause 4) is used to evaluate the change in strippability.

### 5.3 Preconditioning

If specified, precondition the specimen as required by the detail specification.

### 5.4 Conditioning

Not applicable.

### 5.5 Recovery

Unless otherwise required by the relevant specification, the specimen shall remain under standard atmospheric condition for recovery for a period greater than 12 h but not more than 48 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;
- coating strip force;
- initial pH of the water.

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

- description of all key equipment.

## **8 Specification information**

The detail specification shall specify the following information:

- pass/fail criteria;
  - information to be reported;
  - any deviations to the procedure that apply.
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