



SLOVENSKI STANDARD
oSIST prEN IEC 60794-1-212:2023
01-april-2023

Optični kabli - 1-212. del: Splošna specifikacija - Osnovni preskusni postopki za optične kable - Okoljske preskusne metode - Temperaturno cikliranje s kabelskimi elementi, pritrjenimi na obeh koncih, metoda F12

Optical fibre cables - Part 1-212: Generic specification - Basic optical cable test procedures - Environmental test methods - Temperature cycling with cable elements fixed at both ends, Method F12

STANDARD PREVIEW
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OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
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TITLE:

Optical fibre cables - Part 1-212: Generic specification - Basic optical cable test procedures - Environmental test methods - Temperature cycling with cable elements fixed at both ends, Method F12

PROPOSED STABILITY DATE: 2026

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES –

**Part 1-212: Generic specification –
Basic optical cable test procedures –
Environmental test methods – Temperature cycling with cable elements
fixed at both ends, Method F12**

FOREWORD

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IEC 60794-1-212 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is an International Standard.

This first edition cancels and replaces Method F12 of the second edition of IEC 60794-1-22:2017, which will be withdrawn. It includes an editorial revision, based on the new structure and numbering system for optical fibre test methods. Additionally, there are a few technical changes.

This edition includes the following significant technical changes with respect to IEC 60794-1-22:2017:

- a) changed the title, scope and main body that the test procedure examine the attenuation behaviour an optical fibre cable with cable elements fixed at both ends;
- b) added a few sub-clauses for the section with the procedure;
- c) arranged the preparation of cable sample and test set-up in a logical way;

- 79 d) added Figure 1 for illustration of the preparation of cable sample, DUT and test set-up;
- 80 e) changed the temperature tolerance that the temperature chamber shall maintain to
- 81 ± 3 °C as done in IEC 60794-1-22, method F1;
- 82 f) moved the reference to IEC 60068-2-14 for the temperature chamber to a note as one
- 83 example of a suitable chamber;
- 84 g) added the maximum change in attenuation in the details to be specified;
- 85 h) added a new clause 4.6 for details to be reported.

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

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

87

88 Full information on the voting for its approval can be found in the report on voting indicated in

89 the above table.

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

91 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in

92 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available

93 at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are

94 described in greater detail at www.iec.ch/standardsdev/publications.

95 The committee has decided that the contents of this document will remain unchanged until the

96 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to

97 the specific document. At this date, the document will be

- 98 • reconfirmed,
- 99 • withdrawn,
- 100 • replaced by a revised edition, or
- 101 • amended.

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103

INTRODUCTION

104 This document defines the test method F12 to measure the attenuation behavior (change in
105 attenuation) when an optical fibre cable with cable elements fixed at both ends is subjected to
106 temperature cycling. This test assesses the attenuation behaviour of a cable under a no-end
107 movement condition intended for termination with, for example, connectors or passive
108 components.

109 This document cancels and replaces method F12 of IEC 60794-1-22:2017, which will be
110 withdrawn. It includes an editorial revision, based on the new structure and numbering system
111 for optical fibre cable test methods. Additionally, technical changes were implemented. The
112 environmental tests contained in IEC 60794-1-22:2017 will be individually numbered in the IEC
113 60794-1-2xx series. Each test method is now considered to be an individual document rather
114 than part of a multi-test method compendium. Full cross-reference details are given in IEC
115 60794-1-2.

116 The main performance of a terminated cable is the optical transmission performance during
117 environmental variations, i.e. during temperature changes. Therefore, the test method F12 is
118 recommended to be performed for cables intended to be terminated with connectors. Moreover
119 this method can be optionally used as an indicator for cables terminated with hardened
120 connectors or fixed into a module and the fibres terminated with connectors.

121 IEC TR 62959 provides information on cable shrinkage characterisation of optical fibre cables
122 that consist of standard glass optical fibres for telecommunication applications. The
123 characterisation is directed to the effects of cable shrinkage or cable element shrinkage on the
124 termination of cables. Recommended test methods for the evaluation of cable shrinkage are
125 provided and classification by the use of a “grading” system are given as guidance.

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OPTICAL FIBRE CABLES –

Part 1-212: Generic specifications – Basic optical cable test procedures – Environmental test methods – Temperature cycling with cable elements fixed at both ends, method F12

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136 **1 Scope**

137 This part of IEC 60794 defines the test procedure to examine the attenuation behaviour (change
138 in attenuation) when an optical fibre cable with cable elements fixed at both ends is subjected
139 to temperature cycling. This test assesses the attenuation behaviour of a cable under a no-end
140 movement condition intended for termination with, for example, interconnecting devices or
141 passive components.

142 NOTE IEC 60794-1-22, method F1, is a general temperature cycling test for cables

143 **2 Normative references**

144 The following documents are referred to in the text in such a way that some or all of their content
145 constitutes requirements of this document. For dated references, only the edition cited applies.
146 For undated references, the latest edition of the referenced document (including any
147 amendments) applies.

148 IEC 60793-1-46, *Optical fibres - Part 1-46: Measurement methods and test procedures -*
149 *Monitoring of changes in optical transmittance*

150 IEC 60794-1-1, *Optical fibre Cables – Part 1-1: Generic specification – General*

151 IEC 60794-1-22, *Optical fibre Cables – Part 1-22: Generic specification – Basic optical cable*
152 *test procedures – Environmental test methods*

153 **3 Terms and definitions**

154 For the purposes of this document, the terms and definitions given in IEC 60794-1-1 apply.

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

- 157 • IEC Electropedia: available at <http://www.electropedia.org/>
- 158 • ISO Online browsing platform: available at <http://www.iso.org/obp>

159 **4 Method F12 – Temperature cycling with cable elements fixed at both ends**

160 **4.1 Sample**

161 The sample shall be taken from a finished cable length. The sample length shall be longer than
162 the device under test (DUT) to allow for connection to the optical measurement device outside
163 the temperature chamber and, if necessary, to have sufficient length to permit optical
164 measurements, as shown in Figure 1. The length of DUT shall be as specified in the relevant
165 specification. If the length of DUT is not specified, then a length of 10 m should be used.

166 **4.2 Apparatus**

167 The apparatus shall consist of the following:

- 168 a) a temperature chamber suitable to accommodate the DUT and to maintain the specified
169 temperature within ± 3 °C;

170 b) attenuation monitoring equipment according to IEC 60793-1-46.

171 NOTE One example of a suitable chamber is given in Clause 8 of IEC 60068-2-14:2009.

172 4.3 Procedure

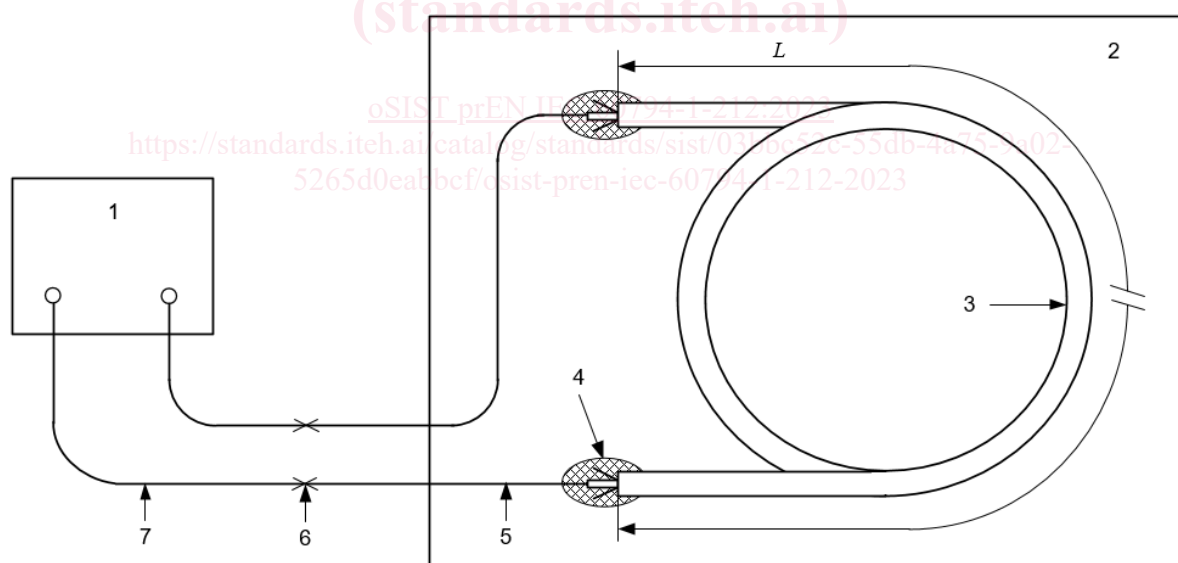
173 4.3.1 Preparation of cable sample and DUT

174 The cable sample length shall be longer than the length of the DUT to allow for connection to
 175 the optical measurement device outside the temperature chamber and, if necessary, to have
 176 sufficient length to permit optical measurements. The DUT shall be coiled with a diameter larger
 177 than the minimum bending diameter specified for the cable in service. At both ends of the length
 178 of the DUT, all components of the cable shall be fixed together to avoid any relative movement
 179 between the cable elements at the fixing point, as shown in Figure 1. All cable elements (e.g.
 180 simplex cable) or at the individual cable units (e.g. simplex cable units within a breakout cable)
 181 at both ends of the DUT where for example connectors or passive components are intended to
 182 be terminated shall be fixed together. The fixing may be by means of clamps, or adhesive
 183 bonding, for example. Such fixing shall not affect the attenuation of the test sample.

184 NOTE If a cable sample terminated with connectors is prepared for temperature cycling testing, then it can be tested
 185 in accordance with IEC 61300-2-22.

186 4.3.2 Preparation of test

187 The DUT shall be placed in the temperature chamber, as shown in Figure 1, with a method of
 188 storage that shall not affect the optical fibre with respect to expansion or contraction. The optical
 189 fibre ends (outside the chamber) of the cable sample may be temporarily joint to pigtails. The
 190 deployment of the cable sample outside the chamber shall not affect the results.



191

192 Key

193 1 attenuation measurement device

194 2 temperature chamber

195 3 DUT, example shown of a simplex cable

196 4 all cable elements fixed at the end of DUT

197 5 optical fibre of cable sample including the DUT

198 6 fibre connection (e.g. splice)

199 7 optical fibre

200 L length of DUT

201

Figure 1 – Preparation of the cable sample, DUT and test set-up

202 4.3.3 Preconditioning

203 Preconditioning procedures, if any, shall be performed as agreed between the customer and
204 the supplier.

205 4.3.4 Temperature cycling

206 The temperature cycling shall be performed in accordance with IEC 60794-1-22, method F1.
207 Temperature cycling with the first cycle procedure shall be performed as follows:

- 208 - the temperature of the chamber shall be decreased to the lower temperature T_{A1}/T_{A2} at an
209 appropriate cooling rate;
- 210 - as soon as the temperature in the chamber has reached stable condition, the sample shall
211 be exposed to the lower temperature during an appropriate time interval t_1 ;
- 212 - the temperature in the chamber is then increased to the specified high temperature T_{B1}/T_{B2}
213 at an appropriate heating rate;
- 214 - as soon as the temperature in the chamber has reached stable condition, the sample shall
215 be exposed to the high temperature during an appropriate time interval t_1 ;
- 216 - the temperature in the chamber is then decreased to ambient temperature.

217 This procedure corresponds to one cycle. The cooling and heating rate shall not exceed 60 °C/h.
218 One or more cycles shall be performed according to the relevant specification.

219 4.4 Requirements

220 The maximum change in attenuation during and after the test shall be as specified in the
221 relevant specification. The change in attenuation shall be calculated relative to the initial
222 attenuation at ambient before the start of the test.

223 4.5 Details to be specified

224 The relevant specification shall include the following:

- 225 a) length of DUT;
- 226 b) number of cycles;
- 227 c) values of T_{A1}/T_{A2} , T_{B1}/T_{B2} and t_1 ;
- 228 d) maximum change in attenuation at the specified wavelength(s) during and after the test.

229 4.6 Details to be reported

230 The test report shall include all the information given in 4.5 and the following:

- 231 a) method of sample storage (e.g. cable coil diameter) in the temperature chamber;
- 232 b) preconditioning procedure, if any;
- 233 c) method of fixing the cable elements at the fixing points at both ends;
- 234 d) description of used test and measurement equipment;
- 235 e) change in attenuation at the specified wavelength(s) of the DUT during and after test;
- 236 f) any deviations from this test method.