



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

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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

Lichtwellenleiterkabel – Teil 1-212: Fachgrundspezifikation – Grundlegende Prüfverfahren für Lichtwellenleiterkabel – Umweltprüfverfahren – Temperaturwechsel mit beidseitig befestigten Kabelementen, Methode F12

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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

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NOTE FROM TC/SC OFFICERS:

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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This first edition cancels and replaces Method F12 of the second edition of IEC 60794-1-22:2017, which will be withdrawn.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;

- 80 d) added Figure 1 for illustration of the preparation of cable sample, DUT and test set-up;
- 81 e) changed the temperature tolerance that the temperature chamber shall maintain to ± 3 °C as
82 done in IEC 60794-1-22, method F1;
- 83 f) moved the reference to IEC 60068-2-14 for the temperature chamber to a note as one
84 example of a suitable chamber;
- 85 g) added all required steps in the subclause for temperature cycling as well as the table for the
86 minimum soak time and the figure for the cycle procedure, and removed the reference to
87 IEC 60794-1-22, method F1;
- 88 h) added the maximum change in attenuation in the details to be specified;
- 89 i) added a new clause 4.6 for details to be reported.

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

Draft	Report on voting
86A/XX/FDIS	86A/XX/RVD

91
92 Full information on the voting for its approval can be found in the report on voting indicated in
93 the above table.

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

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

99 The committee has decided that the contents of this document will remain unchanged until the
100 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
101 specific document. At this date, the document will be

- 102 • reconfirmed,
- 103 • withdrawn,
- 104 • replaced by a revised edition, or
- 105 • amended.

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INTRODUCTION

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

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

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

126 IEC TR 62959 provides information on cable shrinkage characterisation of optical fibre cables
127 that consist of standard glass optical fibres for telecommunication applications. The
128 characterisation is directed to the effects of cable shrinkage or cable element shrinkage on the
129 termination of cables. Recommended test methods for the evaluation of cable shrinkage are
130 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 specification – Basic optical cable test procedures – Environmental test methods – Temperature cycling with cable elements fixed at both ends, Method F12

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140 **1 Scope**

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

146 NOTE IEC 60794-1-201¹ (method F1) is a general temperature cycling test for cables.

147 **2 Normative references**

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

152 IEC 60793-1-46, *Optical fibres – Part 1-46: Measurement methods and test procedures –*
153 *Monitoring of changes in optical transmittance* 60794-1-212:2023

154 <https://standards.iteh.ai/catalog/standards/sist/03bbc52c-55db-4a75-9a02->
154 IEC 60794-1-1, *Optical fibre cables – Part 1-1: Generic specification – General*

155 IEC 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test*
156 *procedures - General guidance*

157 **3 Terms and definitions**

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

159 ISO and IEC maintain terminology databases for use in standardization at the following
160 addresses:

- 161 • IEC Electropedia: available at <https://www.electropedia.org/>
- 162 • ISO Online browsing platform: available at <https://www.iso.org/obp>

163 **4 Method F12 – Temperature cycling with cable elements fixed at both ends**

164 **4.1 Sample**

165 The sample shall be taken from a finished cable length. The sample length shall be longer than
166 the device under test (DUT) to allow for connection to the optical measurement device outside
167 the temperature chamber and, if necessary, to have sufficient length to permit optical

¹ The document is at CDV at the time of publication of this document.

168 measurements, as shown in Figure 1. The length of DUT shall be as specified in the relevant
169 specification. If the length of DUT is not specified, then a length of 10 m should be used.

170 4.2 Apparatus

171 The apparatus shall consist of the following:

- 172 a) a temperature chamber suitable to accommodate the DUT and to maintain the specified
173 temperature within ± 3 °C;
- 174 b) attenuation monitoring equipment according to IEC 60793-1-46.

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

176 4.3 Procedure

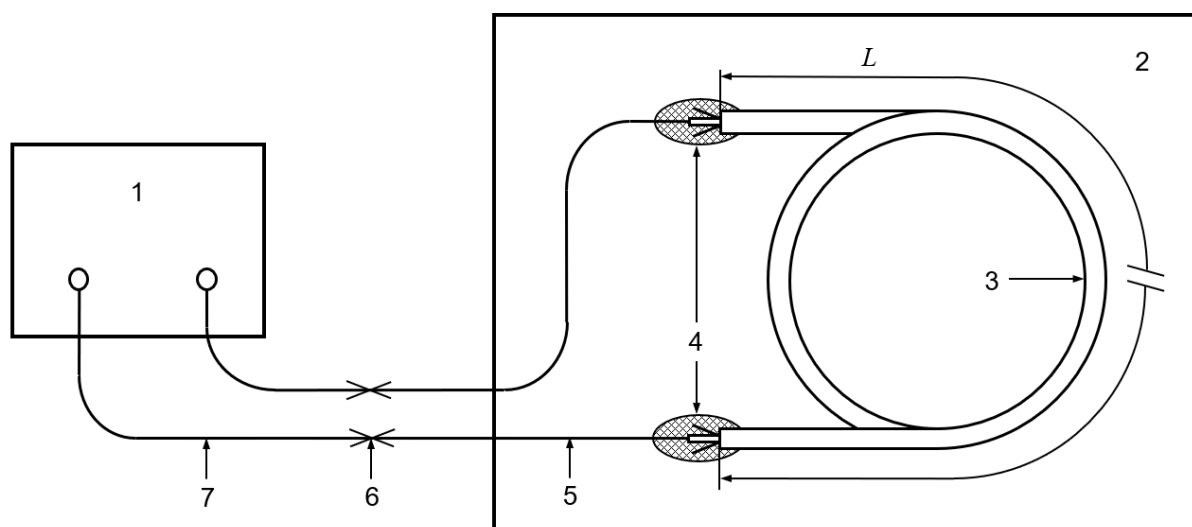
177 4.3.1 Preparation of cable sample and DUT

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

188 4.3.2 Preparation of test

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

193



194

195 **Key**

196 1 attenuation measurement device

197 2 temperature chamber

198 3 DUT, example shown of a simplex cable

199 4 all cable elements fixed at the ends of DUT

200 5 optical fibre of cable sample including the DUT

201 6 fibre connection (for example splice)

202 7 optical fibre

203 L length of DUT

204

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

205 **4.3.3 Preconditioning**

206 The cable sample shall be preconditioned at standard atmospheric conditions as defined in IEC
207 60794-1-2.

208 **4.3.4 Temperature cycling**

209 The temperature in the temperature chamber shall be at ambient temperature. Throughout this
210 procedure, the ambient temperature condition is the standard test condition as defined in IEC
211 60794-1-2. The temperature cycles shall be carried out as shown in Figure 2 and as follows:

- 212 1) the temperature of the chamber shall be decreased to the low temperature T_{A2} at a rate of
213 cooling not to exceed 60 °C/h;
- 214 2) as soon as the temperature in the chamber has reached stable condition, the DUT shall be
215 exposed to the low temperature for the appropriate period t_1 (see next bullet point);
- 216 3) a minimum soak time is given in Table 1; however, the soak time, t_1 , shall be sufficient to
217 bring the DUT to equilibrium with the specified temperature;
- 218 4) the temperature in the chamber is then increased to the high temperature T_{B2} at a rate of
219 heating not to exceed 60 °C/h;
- 220 5) as soon as the temperature in the chamber has reached stable condition, the DUT shall be
221 exposed to the high temperature for the appropriate period t_1 ;
- 222 6) the temperature in the chamber shall be decreased to ambient temperature at a rate of
223 cooling not to exceed 60 °C/h.