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Kabli iz optičnih vlaken - 1-23. del: Splošna specifikacija - Osnovni preskusni postopki za optične kable - Preskusne metode za kabske elemente

Optical fibre cables - Part 1-23: Generic specification - Basic optical cable test procedures - Cable element test methods

Lichtwellenleiterkabel - Teil 1-23: Fachgrundspezifikation - Grundlegende Prüfverfahren für Lichtwellenleiterkabel - Prüfverfahren für Kabelelemente

Câbles à fibres optiques - Partie 1-23: Spécification générique - Procédures fondamentales d'essai des câbles optiques - Méthodes d'essais d'éléments de câbles

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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. |
| FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY | |
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TITLE:

Optical fibre cables - Part 1-23: Generic specification - Basic optical cable test procedures - Cable element test methods

PROPOSED STABILITY DATE: 2020

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRE CABLES

**Part 1-23: Generic specification – Basic optical
cable test procedures – Cable element test methods**

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.
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- International Standard IEC 60794-1-23 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This edition of IEC 60794-1-23 cancels and replaces the first edition published in 2012. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) addition of a new test Method G9: Bleeding and evaporation (formerly known as Method E15 in IEC 60794-1-21:2015);
- b) addition of a new test Method G10A: Stripping force stability of cabled optical fibres (formerly known as Method E5A in IEC 60794-1-21:2015);
- c) addition of a new test Method G10B: Strippability of optical fibre ribbons (formerly known as Method E5B in IEC 60794-1-21:2015);

- 195 d) addition of a new test Method G10C: Strippability of buffered optical fibres (formerly
196 known as Method E5C in IEC 60794-1-21:2015);
- 197 e) addition of a new test Method G11A: Tensile strength and elongation of buffer tubes
198 (included in IEC 60811-501);
- 199 f) addition of a new test Method G11B: Elongation of buffer tubes at low temperature
200 (included in IEC 60811-505);
- 201 g) clarification of the sample preparation procedure in Method G5: Ribbon tear (separability);

202

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

| FDIS | Report on voting |
|-------------|------------------|
| 86A/XX/FDIS | 86A/XX/RVD |

204

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

207 This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

208 A list of all parts in the IEC 60794 series, published under the general title *Optical fibre cables*,
209 can be found on the IEC website.

210 The committee has decided that the contents of this document will remain unchanged until the
211 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to
212 the specific document. At this date, the document will be

- 213 • reconfirmed,
- 214 • withdrawn,
- 215 • replaced by a revised edition, or
- 216 • amended.

217

218 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.

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OPTICAL FIBRE CABLES

Part 1-23: Generic specification – Basic optical cable test procedures – Cable element test methods

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1 Scope

227 This part of IEC 60794 describes test procedures to be used in establishing uniform
228 requirements for the geometrical, material, mechanical, environmental properties of optical
229 fibre cable elements.

230 This document applies to optical fibre cables for use with telecommunication equipment and
231 devices employing similar techniques, and to cables having a combination of both optical
232 fibres and electrical conductors.

233 Throughout the document, the wording “optical cable” can also include optical fibre units,
234 microduct fibre units, etc.

235 See IEC 60794-1-2 for a reference guide to test methods of all types and for general
236 requirements and definitions.

237 NOTE The environmental testing of optical fibre ribbon would be valuable for some applications. Useful
238 information about suitable test methods can be found in the fibre series IEC 60793-1-50 - 53.

2 Normative references

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

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

246 IEC 60794-1-31:—1, *Optical fibre cables – Part 1-31: Sectional specification for cable element*
247 *– Optical fibre ribbon*

248 IEC 60793-1-32:2010, *Optical fibres – Part 1-32: Measurement methods and test procedures*
249 *– Coating strippability*

250 IEC 60793-1-40, *Optical fibres – Part 1-40: Measurement methods and test procedures –*
251 *Attenuation*

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

254 IEC 60811-401, *Electric and optical fibre cables - Test methods for non-metallic materials -*
255 *Part 401: Miscellaneous tests - Thermal ageing methods - Ageing in an air oven*

3 Terms and definitions

257 No terms and definitions are listed in this document.

258 ISO and IEC maintain terminological databases for use in standardization at the following
259 addresses:

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

¹ Under preparation. Stage at the time of publication: IEC CCDV 60794-1-31:2016.

262 **4 Method G1: Bend test for optical cable elements**

263 **4.1 Object**

264 The purpose of this test is to characterize cable elements for splicing purposes by
265 determining the attenuation increase of an optical cable element (fibre, ribbon, core tube,
266 breakout unit, etc.) when bent within a splice closure or similar device.

267 **4.2 Sample**

268 The length of the sample of optical cable element shall be sufficient to carry out the testing
269 specified.

270 **4.3 Apparatus**

271 The apparatus consists of

- 272 a) a mandrel having a smooth surface with diameter as stated in the detail specification, and
- 273 b) an attenuation measuring apparatus for the determination of attenuation change
274 (according to the test methods of IEC 60793-1-40 and IEC 60793-1-46).

275 **4.4 Procedure**

276 The element to be tested shall be wound on the mandrel at minimal tension; the number of
277 turns shall be stated in the detail specification.

278 In order to measure the attenuation increase caused by bending, allowance should be made
279 for the intrinsic attenuation of the fibre.

280 **4.5 Requirements**

281 Any increase in attenuation shall comply with the limits shown in the detail specification.

282 **4.6 Details to be specified**

283 The detail specification shall include the following:

- 284 a) optical test wavelength;
- 285 b) diameter of the mandrel;
- 286 c) number of turns;
- 287 d) apparatus and attenuation measuring technique;
- 288 e) temperature at which the evaluation shall be performed if different from room temperature.

289 **5 Method G2: Ribbon dimensions and geometry – Visual method**

290 **5.1 Object**

291 The purpose of this test is to determine the geometry of an optical fibre ribbon as defined by
292 the parameters of width, height and fibre alignment, for the purpose of type testing to assume
293 proper manufacturing process control. This test is not necessarily suitable for final product
294 inspection and, unless otherwise specified, shall not be used for that purpose.

295 **5.2 Sample**

296 The number of samples to be tested shall be specified in the detail specification. The selected
297 samples shall be statistically independent and representative of the ribbon population tested.

298 **5.3 Apparatus**

299 The apparatus consists of a microscope or profile projector with appropriate magnification.

300 **5.4 Procedure**

301 **5.4.1 General**

302 Either of the two following procedure methods may be used.

303 For the specified number of samples, all dimensions shall be measured as average as well as
304 maximum and minimum values.

305 Care should be taken that the preparation of the sample does not change the structure of the
306 fibre ribbon and represents an undisturbed image of the fibre cladding and ribbon cross-
307 section.

308 **5.4.2 Method 1**

309 The sample is prepared by cutting it perpendicular to the axis of the ribbon and placing it in a
310 curable resin or in a tool which holds the ribbon. If necessary, the sample shall be ground and
311 polished to prepare a smooth perpendicular end face. The prepared sample is secured with its
312 end face perpendicular to the optical path and measured by means of a microscope or profile
313 projector.

314 **5.4.3 Method 2**

315 Place the ribbon in a ribbon fibre holder and remove 20 mm to 25 mm of the fibre coating and
316 matrix material with the ribbon hot sheath stripping tool and wipe the stripped portion of the
317 fibres clean with an alcohol-moistened pad. Adjust the position of the ribbon in the ribbon fibre
318 holder and cleave the fibres at a distance of 250 µm to 500 µm from the stripped edge of the
319 ribbon. Cut and polish the other end of the ribbon, and illuminate it with a collimated light
320 source. Align and measure the cleaved end of the ribbon under microscope.

321 **5.5 Requirements**

322 Unless otherwise specified in the detail specification, the width, height and fibre alignment
323 shall be in accordance with IEC 60794-1-31:—2, Table 1.

324 **5.6 Details to be specified**

325 The detail specification shall include the following:

- 326 a) permissible maximum and minimum values;
- 327 b) limits for average values;
- 328 c) number of samples tested.

329 **5.7 Definitions of ribbon dimensions and geometry**

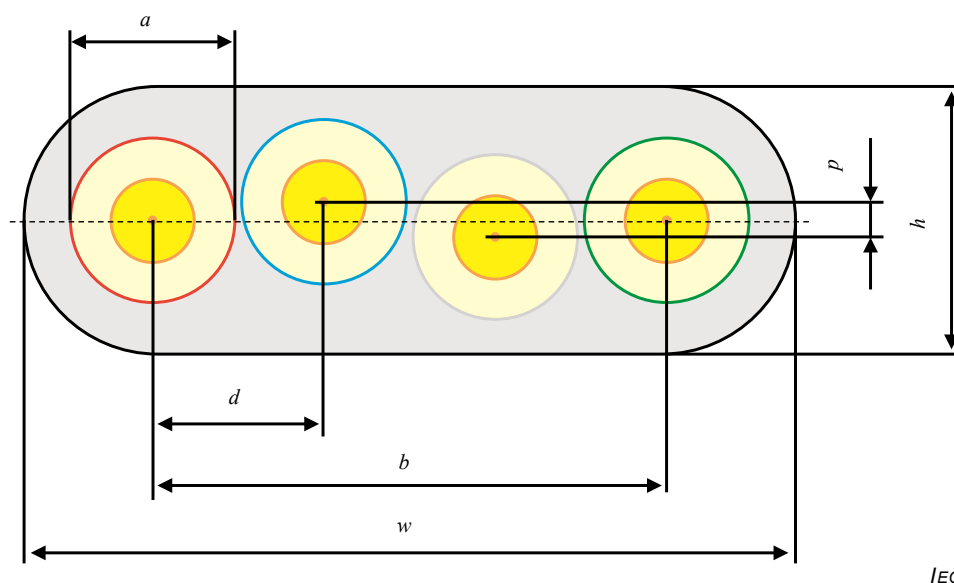
330 **5.7.1 General**

331 The following definitions apply to a fibre ribbon cross-section as shown in Figure 1. The figure
332 illustrates an example for a 4-fibre ribbon, where a is the diameter of a coloured fibre.

333 NOTE In consideration of the precision of fibre geometric attributes and the relatively larger precision of ribbon
334 geometry requirements, it is acceptable for glass core/glass cladding fibres to use the edge of the cladding for the
335 measurements of 5.7.3 and 5.7.4 in lieu of the fibre centres. In this case, the measurements can be made on the
336 same side of all fibres (e.g. top or bottom, left or right side).

337

² Under preparation. Stage at the time of publication: IEC CCDV 60794-1-31:2016.



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Figure 1 – Cross-sectional drawing illustrating fibre ribbon geometry

5.7.2 Width and height

341 The width w and height h of the ribbon are the dimensions of the minimum rectangular area
342 enclosing the ribbon cross-section.

5.7.3 Basis line

344 The basis line is that line in the cross-section of an optical fibre ribbon crossing the fibre
345 centres of the first fibre (fibre 1) and the last fibre (fibre n) of the fibre ribbon, as shown in
346 Figure 1 as dotted line. This line is used as the reference plane for the fibre alignment
347 measurements.

5.7.4 Fibre alignment

5.7.4.1 Horizontal fibre separation

350 The horizontal separation of fibres is the distance of the orthogonal projection of two fibre
351 centres on the basis line in the fibre ribbon cross-section.

352 Two horizontal separation parameters can be distinguished:

- 353 a) centre-centre distance d between adjacent fibres;
- 354 b) centre-centre distance b between the extreme fibres.

5.7.4.2 Planarity

356 The planarity p of the fibre ribbon structure is the sum of the maximum positive and absolute
357 value of the maximum negative vertical separation of the fibres.

358 The vertical separation of the fibres is the orthogonal distance from the fibre centre to the
359 basis line. The vertical separation is positive for fibres “above” the basis line and negative for
360 fibres “below” the basis line.

361 6 Method G3: Ribbon dimensions – Aperture gauge

362 6.1 Object

363 The purpose of this test is to verify the functional performance of a ribbon. In order to ensure
364 functional performance, the dimensions of edge bonded ribbons may be controlled and
365 verified for final inspection purposes with an aperture gauge. The intent is to verify that the
366 end portion of a ribbon can be inserted into and would be reasonably aligned to the guide
367 slots of commercial stripping tools.