



SLOVENSKI STANDARD
oSIST prEN IEC 63267-2-2:2023
01-september-2023

Optični spojni elementi in pasivne komponente - Vmesniki optičnih konektorjev za izboljšana mnogorodovna optična vlakna zaradi upogibanja - 2-2. del: Parametri konektorjev s fizičnim stikom za vlakna s premerom jedra 50 µm - Nepoševno in poševno za aplikacije referenčnih konektorjev

Fibre optic interconnecting devices and passive components - Connector optical interfaces for enhanced macro bend multimode fibre - Part 2-2: Connection parameters of physically contacting 50 µm core diameter fibres - Non-angled and angled for reference connector applications

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Ta slovenski standard je istoveten z: prEN IEC 63267-2-2:2023

ICS:

33.180.20	Povezovalne naprave za optična vlakna	Fibre optic interconnecting devices
oSIST prEN IEC 63267-2-2:2023		en



86B/4761/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:

IEC 63267-2-2 ED1

DATE OF CIRCULATION:

2023-06-23

CLOSING DATE FOR VOTING:

2023-09-15

SUPERSEDES DOCUMENTS:

86B/4712/CD, 86B/4734A/CC

IEC SC 86B : FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS	
SECRETARIAT: Japan	SECRETARY: Mr Shigeru Tomita
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TITLE:

Fibre optic interconnecting devices and passive components – Connector optical interfaces for enhanced macro bend multimode fibre – Part 2-2: Connection parameters of physically contacting 50 µm core diameter fibres - Non-angled and angled for reference connector applications

PROPOSED STABILITY DATE: 2029

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**FIBRE OPTIC INTERCONNECTING DEVICES AND
PASSIVE COMPONENTS –
CONNECTOR OPTICAL INTERFACES FOR ENHANCED MACRO BEND
MULTIMODE FIBRE –
Part 2-2: Connection parameters of physically contacting 50 µm core
diameter fibres - Non-angled and angled for reference connector
applications**

FOREWORD

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International Standard IEC 63267-2-2 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

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The text of this standard is based on the following documents:

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

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Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

- 85 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.
- 86 The committee has decided that the contents of this publication will remain unchanged until the
87 stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to
88 the specific publication. At this date, the publication will be
- 89 • reconfirmed,
 - 90 • withdrawn,
 - 91 • replaced by a revised edition, or
 - 92 • amended.
- 93
- 94 A bilingual version of this publication may be issued at a later date.
- 95

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96 **FIBRE OPTIC INTERCONNECTING DEVICES AND**
97 **PASSIVE COMPONENTS –**
98 **CONNECTOR OPTICAL INTERFACES FOR ENHANCED MACRO BEND**
99 **MULTIMODE FIBRE –**

100 **Part 2-2: Connection parameters of physically contacting 50 µm core**
101 **diameter fibres - Non-angled and angled for reference connector**
102 **applications**

103 **1. Scope**

104 This part of the IEC 63267 series defines the dimensional limits of an optical interface for
105 reference connections necessary to meet specific requirements for fibre-to-fibre interconnection
106 of non-angled and angled polished multimode reference connectors intended to be used for
107 attenuation measurements in the field or factory.

108 Several grades of reference connections are defined in this document. The multimode reference
109 connections are terminated to restricted IEC 60793-2-10 A1-OM2b to A1-OM5b fibre at the
110 850 nm band only. The geometrical dimensions and tolerances of the specified reference
111 connections have been developed primarily to limit the variation in measured attenuation
112 between multiple sets of two reference connectors, and therefore to limit the variation in
113 measured attenuation between randomly chosen reference connectors when mated with
114 connectors in the field or factory.

115 **2. Normative references**

116 The following documents, in whole or in part, are normatively referenced in this document and
117 are indispensable for its application. For dated references, only the edition cited applies. For
118 undated references, the latest edition of the referenced document (including any amendments)
119 applies.

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

122 IEC 61300-1, *Fibre optic interconnecting devices and passive components – Basic test and*
123 *measurement procedures – Part 1: General and Guidance.*

124 IEC 61300-3-4, *Fibre optic interconnecting devices and passive components – Basic test and*
125 *measurement procedures – Part 3-4: Examinations and measurements – Attenuation.*

126 IEC 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test*
127 *and measurement procedures – Part 3-35: Examinations and measurements –*
128 *Visual inspection of fibre optic connectors and fibre-stub transceivers*

129 IEC 63267-1, *Fibre optic connector optical interfaces – Part -1: Optical interfaces for 50µm core*
130 *diameter fibres- General and guidance*

131
132 **3. Terms and definitions.**

133 For the purposes of this document, the terms and definitions given in IEC 63267-1 apply.
134 ISO and IEC maintain terminological databases for use in standardization at the following
135 addresses:

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

138 **4. Performance grades**

139 This document currently specifies several performance grades.

140 The performance grade for Physical Contact non-angled and angled polished fibre to fibre
 141 reference connections detailed in this document is shown in Table 1.

142 The attenuation is measured in accordance with IEC 61300-3-4 (Insertion method B).

143 The maximum attenuation of reference grade connections mated with standard grade B_m
 144 connections is specified in Annex B.

145 **Table 1 – Attenuation grades for multimode reference connectors at 850 nm**

Reference grade	Attenuation [dB]
R _{m1}	≤0,1
R _{m12}	≤0,15
R _{m16}	≤0,15
R _{m16A}	≤0,15
R _{m24}	≤0,15
R _{m32}	≤0,15
Note 1 The number in the designation of the reference grade indicates the number of fibres in the reference connector. The letter "A" indicates an angled physical contact interface	
Note 2 as described in annex A, the contribution to measurement uncertainty in attenuation measurement between any connector according the IEC optical interface standards in the 63267 series and a population of IEC reference connectors is for all performance grades ±0,071	
Note 3 Grade R _{m1} reference connection applies to 1,25 mm and 2,5 mm single fibre cylindrical ferrules while all other reference grades apply to multifibre rectangular ferrules.	

146 **5. Description**

147 Optical reference connections are connections manufactured with restricted dimensional
 148 tolerances on dimensions that contribute to lateral and angular offset of such optical
 149 connections. These connections are mainly used for attenuation measurement purposes in field
 150 and factory and shall be considered as part of the measurement setup. The goal is to strongly
 151 reduce the measurement uncertainty. The attenuation uncertainties due to the reference
 152 connections are defined in this document, and are discussed in Annex A.

153 The performance of an multimode optical interface is not only determined by the alignment
 154 accuracy of the optical datum targets of two mating fibres, but largely by any fibre parameter
 155 mismatches.

156 Parameters influencing the fibre to fibre intrinsic attenuation include:

- 157 • Core diameter (CD) mismatch;
- 158 • Numerical aperture (NA) mismatch.

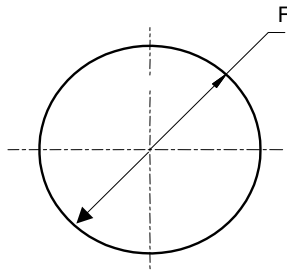
159 **6. Criteria for a fit within the performance grade**

160 Figure 1 and Table 2 give the criteria for meeting the performance grades as listed
 161 in Table 1. The parameters that are selected for the criteria definition are based on their
 162 degree of significance in affecting the performance.

163 All R_m multimode reference connections shall be terminated on selected multimode (MM)
 164 A1-OM2b to A1-OM5b fibre, as specified in IEC 60793-2-10 with a core diameter of 50 μm ±
 165 0,5 μm and a numerical aperture of 0,200 ± 0,002 . The selection is required to restrict the
 166 variability of attenuation measurements using reference connectors.

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179 **Figure 1 – Geometrical requirements for fibre core location after termination**

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Table 2 – Lateral offset values for grade R_m reference connections

Reference grade	F [μm] ¹	
	Minimum	Maximum
R_{m1}	0	1,0
R_{m12}	0	1,0
R_{m16}	0	1,0
R_{m16A}	0	1,0
R_{m24}	0	1,0
R_{m32}	0	1,0

Note 1 Parameter F defines the core location of a reference connector in relation to the optical datum target (figure 1). In addition, parameter F describes also the maximum lateral offset between the fibre cores of two mated reference connectors.

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NOTE Lateral offset of R_m grades for rectangle ferrules consists both the fiber true position on the ferrule and the relative ferrule position from guide pin and bore fitting.

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7. Attenuation measurement uncertainty contribution

185 Using the prescribed fibre geometry and the dimensional tolerances mentioned in clause 6, it
186 is possible to achieve measurements using the specified reference connections that have an
187 uncertainty of $\pm 0,071$ dB, with random varied reference connections and the target EF launch
188 as specified in IEC 61300-1 is satisfied (See Annex A).

189

8. Visual inspection

190 The fibre end faces of all reference grade variants shall be inspected to IEC 61300-3-35 and
191 shall meet the requirements as detailed in table 3.
192 The zone size for multimode fibres has been set at 65 μm . This has been done to simplify the
193 grading process.

194

Table 3 – Visual requirements for multimode PC and APC polished connection

Zone (diameter)	Defects (diameter)	Scratches (width)
A: core 65 μm	No limit < 2 μm Maximum 4 $\geq 2 \mu\text{m}$ and $\leq 5 \mu\text{m}$ None > 5 μm	No limit < 3 μm Maximum 4 $\geq 3 \mu\text{m}$ and $\leq 4 \mu\text{m}$ None > 4 μm
B: cladding 65 μm to 110 μm	No limit $\leq 25 \mu\text{m}$ None > 25 μm	No limit

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Annex A (informative) Multimode attenuation measurement uncertainty contribution

198 A.1 Introduction

199 The attenuation of a multimode connectorised component (or connector) based on a cylindrical
200 ferrule is measured against a R_{m1} reference connector in a reference adapter and when based
201 on rectangular ferrules against the relevant pinned/unpinned R_{m12} to R_{m32} reference connector.
202 Since reference connection parts vary within the tolerances allowed in this standard, the
203 variability has to be considered as a contribution to the attenuation measurement uncertainty
204 of the setup.

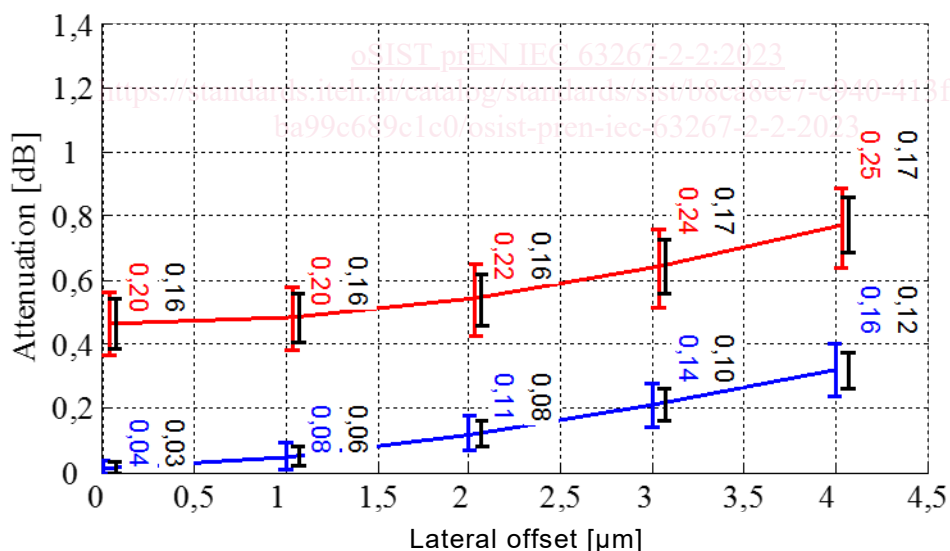
205 A.2 Sources of variability

206 A.2.1 Measurement condition and setup

207 Measurement condition variability is caused by factors such as power meter calibration, finite
208 display resolution, linearity, connector/detector coupling repeatability, source stability and
209 launch conditions. IEC TR 62627-04 gives a more detailed explanation how to determine this
210 uncertainty for single mode fibres and it can be adapted for use with MM connections.

211 A.2.2 Geometry mismatch

212 Another factor causing variability is the mismatch between the fibre geometry parameters of the
213 reference connector and the DUT connector, such as core diameter (CD), numerical aperture
214 (NA) and lateral offset. For the calculation, worst case mismatch is used assuming that the DUT
215 fibre has CD of 47,5 μm and a NA of 0,185. The calculated uncertainty also depends on the
216 offset between the fibre cores of reference and DUT plugs. See Figure A.1



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218 **Figure A.1 - Attenuation measurement uncertainty contribution for Grade Rm reference**
219 **connections resulting from lateral offset, NA and CD mismatch**

220 The red line presents the averaged result of a Monte Carlo Simulation (MCS) of the calculated
221 attenuation of a DUT plug with a worst-case minimal CD and NA (47,5 μm and 0,185 NA) mated
222 to 6 000 Grade R_m reference connectors.

223 The blue line presents the averaged result of the MCS of the calculated attenuation of a DUT
224 plug with nominal CD and NA (50 μm and 0,200 NA) mated to 6 000 Grade R_m reference
225 connectors.