



**SLOVENSKI STANDARD**  
**oSIST prEN IEC 62149-3:2023**

**01-marec-2023**

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**Aktivne komponente in naprave optičnih vlaken - Izvedbeni standardi - 3. del:  
Laserski diodni oddajniki z integriranim modulatorjem za optične prenosne  
sisteme 40 Gbit/s**

Fibre optic active components and devices - Performance standards - Part 3: Modulator-integrated laser diode transmitters for 40-Gbit/s fibre optic transmission systems

Aktive Lichtwellenleiterbauelemente und -geräte - Betriebsverhalten - Teil 3: Sender mit modulatorintegrierten Laserdioden für 40 Gbit/s-Lichtwellenleiter-Übertragungssysteme

Composants et dispositifs actifs fibroniques - Normes de performances - Partie 3: Émetteurs à diodes laser à modulateur intégré pour systèmes de transmission fibroniques 40 Gbit/s

**Ta slovenski standard je istoveten z: prEN IEC 62149-3:2023**

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**ICS:**

33.180.20	Povezovalne naprave za optična vlakna	Fibre optic interconnecting devices
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## 86C/1839/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: <b>IEC 62149-3 ED4</b>	
DATE OF CIRCULATION: <b>2023-01-06</b>	CLOSING DATE FOR VOTING: <b>2023-03-31</b>
SUPERSEDES DOCUMENTS: <b>86C/1799/CD, 86C/1818A/CC</b>	

IEC SC 86C : FIBRE OPTIC SYSTEMS AND ACTIVE DEVICES	
SECRETARIAT: United States of America	SECRETARY: Mr Fred Heismann
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:

**Fibre optic active components and devices - Performance standards - Part 3: Modulator-integrated laser diode transmitters for 40-Gbit/s fibre optic transmission systems**

PROPOSED STABILITY DATE: 2026

NOTE FROM TC/SC OFFICERS:

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES –  
PERFORMANCE STANDARDS –****Part 3: Modulator-integrated laser diode transmitters  
for 40-Gbit/s fibre optic transmission systems**

## FOREWORD

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IEC 62149-3 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2020 and Corrigendum 1:2021. This edition constitutes a technical revision.

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

- a) specification of pull force for fibre pull test in Table 6 according to fibre type;
- b) change of symbol for kink free radiant power in Table 4 and Table 5;
- c) replacement of undefined symbols in Table 7;
- d) addition of IEC 62149-1 as a normative reference;
- e) addition of four ITU-T Recommendations in the Bibliography.

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

FDIS	Report on voting
86C/xxxx/FDIS	86C/xxxx/RVD

89  
90 Full information on the voting for its approval can be found in the report on voting indicated in the  
91 above table.

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

93 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in  
94 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available  
95 at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are  
96 described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

97 A list of all parts in the IEC 62149 series, published under the general title *Fibre optic active*  
98 *components and devices – Performance standards*, can be found on the IEC website.

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 "<http://webstore.iec.ch>" in the data related to  
101 the 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 Fibre optic transmitters are used to convert electrical signals into optical signals. This document  
110 covers the performance standard for optical modulators monolithically integrated with laser  
111 diodes for 40 Gbit/s optical telecommunication systems. This document is applicable for on-off  
112 keying formats.

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# FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PERFORMANCE STANDARDS –

## Part 3: Modulator-integrated laser diode transmitters for 40-Gbit/s fibre optic transmission systems

### 1 Scope

This part of IEC 62149 covers the performance specification for electroabsorption (EA) type optical modulators monolithically integrated with laser diodes for 40 Gbit/s fibre optic transmission systems. This document contains definitions for product performance requirements as well as a series of tests and measurements, for which clearly defined conditions, severities and pass/fail criteria are provided. The tests are intended to be run as an initial design verification to prove any product's ability to satisfy this document's requirements. This document is applicable for on-off keying modulation formats.

A product that has been shown to meet all the requirements of a performance standard can be declared as compliant with the performance standard but will then be controlled by a quality assurance program.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60749-7, *Semiconductor devices – Mechanical and climatic test methods – Part 7: Internal moisture content measurement and the analysis of other residual gases*

IEC 60749-26, *Semiconductor devices – Mechanical and climatic test methods – Part 26: Electrostatic discharge (ESD) sensitivity testing – Human body model (HBM)*

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61300-2-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-4: Tests – Fibre or cable retention*

IEC 62007-1, *Semiconductor optoelectronic devices for fibre optic system applications – Part 1: Specification template for essential ratings and characteristics*

IEC 62149-1, *Fibre optic active components and devices – Performance standards – Part 1: General and guidance*

IEC 62572-3, *Fibre optic active components and devices – Reliability standards – Part 3: Laser modules used for telecommunication*

ITU-T Recommendation G.694.1, *Spectral grids for WDM applications: DWDM frequency grid*



158 ITU-T Recommendation G.957, *Optical interfaces for equipments and systems relating to the*  
159 *synchronous digital hierarchy*

160 MIL-STD-883-1, *U.S. Department of Defense – Test method standard – Environmental test*  
161 *methods for microcircuits, Part 1: Test methods 1000-1999*

### 162 **3 Terms, definitions and abbreviated terms**

#### 163 **3.1 Terms and definitions**

164 For the purposes of this document, the terms and definitions given in IEC 62007-1 and IEC 62149-1  
165 apply.

166 ISO and IEC maintain terminological databases for use in standardization at the following  
167 addresses:

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

#### 170 **3.2 Abbreviated terms**

171 DC direct current

172 EA electroabsorption

173 LD laser diode

174 LSL lower standard limit

175 PD photodiode

176 PRBS pseudo-random bit sequence

177 RF radio frequency

178 RH relative humidity

179 USL upper standard limit

### 180 **4 Product parameters**

#### 181 **4.1 Absolute limiting ratings**

182 Absolute limiting (maximum and/or minimum) ratings given in Table 1 imply that no catastrophic  
183 damage will occur if the product is subject to these ratings, provided each limiting parameter is  
184 in isolation and all other parameters have values within the normal performance parameters. It  
185 should not be assumed that limiting values of more than one parameter can be applied at any  
186 one time.

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**Table 1 – Absolute limiting ratings**

Parameter	Symbol	Minimum	Maximum	Unit
Operating case temperature (at the bottom of the case)	$T_{case}$	0	+70	°C
Storage temperature	$T_{stg}$	-40	+85	°C
Soldering temperature (minimum distance to case specified)	$T_{sld}$	-	+260 (for 10 s)	°C
<b>Laser diode</b>				
Reverse voltage	$V_{R(LD)}$	-	2	V
Continuous forward current	$I_{F(LD)}$	-	200	mA
Continuous radiant power	$\phi_e$	-	10	mW
<b>Photodiode</b>				
Reverse voltage	$V_{R(PD)}$	-	10	V
Forward current	$I_{F(PD)}$	-	1	mA
<b>Modulator</b>				
Reverse modulation voltage	$V_{Rm}$	-	5	V
Forward modulation voltage	$V_{Fm}$	-	1	V
<b>Thermal electric cooler</b>				
Cooler current under cooling and heating	$I_p$	-	1,5	A
Cooler voltage under cooling and heating	$V_p$	-	2,5	V

188

**4.2 Operating environment**

189 The operating environment is indicated in Table 2.

191

**Table 2 – Operating environment**

Parameter	Symbol	Value		Unit
		Minimum	Maximum	
Operating case temperature	$T_{case}$	0	+70	°C

192

**4.3 Functional specification**

194 Functional specification shall be within the limit specified in Table 4 at the operating conditions  
195 specified in Table 3.

196

**Table 3 – Operating conditions for functional specification**

Parameter	Symbol	Value		Unit
		Minimum	Maximum	
Laser operating current	$I_{op}$	50	200	mA
Laser operating temperature	$T_{op}$	15	35	°C
Reverse modulation centre voltage	$V_{Rmc}$	0,5	1,5	V
Peak to peak modulation voltage	$V_{Rmpp}$	2	3	V
NOTE Operating conditions are adjusted to match ITU-T Recommendation G.694.1 wavelength within the above specified limit.				

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