

**SLOVENSKI STANDARD**  
**SIST EN IEC 60825-12:2026****01-september-2026****Nadomešča:****SIST EN IEC 60825-12:2019**

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**Varnost laserskih izdelkov - 12. del: Varnost optičnih komunikacijskih sistemov v prostem prostoru, ki se uporabljajo za prenos informacij**

Safety of laser products - Part 12: Safety of free space optical communication systems used for transmission of information

Sicherheit von Lasereinrichtungen - Teil 12: Sicherheit von optischen Freiraumkommunikationssystemen für die Informationsübertragung

Sécurité des appareils à laser - Partie 12 : Sécurité des systèmes de communication optiques en espace libre utilisés pour la transmission d'informations

**Ta slovenski standard je istoveten z: EN IEC 60825-12:2026****ICS:**

31.260	Optoelektronika, laserska oprema	Optoelectronics. Laser equipment
33.180.01	Sistemi z optičnimi vlakni na splošno	Fibre optic systems in general

**SIST EN IEC 60825-12:2026****en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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**EN IEC 60825-12**

May 2026

ICS 31.260

Supersedes EN IEC 60825-12:2019

English Version

**Safety of laser products - Part 12: Safety of free space optical communication systems used for transmission of information  
(IEC 60825-12:2022 + COR1:2024 + COR2:2026)**

Sécurité des appareils à laser - Partie 12 : Sécurité des systèmes de communication optiques en espace libre utilisés pour la transmission d'informations  
(IEC 60825-12:2022 + COR1:2024 + COR2:2026)

Sicherheit von Lasereinrichtungen - Teil 12: Sicherheit von optischen Freiraumkommunikationssystemen für die Informationsübertragung  
(IEC 60825-12:2022 + COR1:2024 + COR2:2026)

This European Standard was approved by CENELEC on 2026-01-28. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

**EN IEC 60825-12:2026 (E)****European foreword**

The text of document 76/717/FDIS, future edition 3 of IEC 60825-12 + COR1:2024 + COR2:2026, prepared by TC 76 "Optical radiation safety and laser equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60825-12:2026.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2027-05-31 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2029-05-31 document have to be withdrawn

This document supersedes EN IEC 60825-12:2019 and all of its amendments and corrigenda (if any).

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This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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The text of the International Standard IEC 60825-12:2022 + COR1:2024 + COR2:2026 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60079-0	NOTE	Approved as EN IEC 60079-0
IEC 60812	NOTE	Approved as EN IEC 60812
IEC 61508 (series)	NOTE	Approved as EN 61508 (series)
IEC 62368-1:2018	NOTE	Approved as EN IEC 62368-1:2020 (not modified) +A11:2020
ISO 12100	NOTE	Approved as EN ISO 12100

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cencenelec.eu](http://www.cencenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60825-1	2014	Safety of laser products - Part 1: Equipment classification and requirements	EN 60825-1	2014
-	-		+ A11	2021
-	-		EN 60825- 1:2014/AC:2017-06	
IEC 60825-2	-	Safety of laser products - Part 2: Safety of optical fibre communication systems (OFCSs)	-	-

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IEC 60825-12

Edition 3.0 2022-12

Corrected version  
2026-01

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Safety of laser products –  
Part 12: Safety of free space optical communication systems used for  
transmission of information**

**Sécurité des appareils à laser –  
Partie 12: Sécurité des systèmes de communication optique en espace libre  
utilisés pour la transmission d'informations**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 31.260

ISBN 978-2-8322-6195-8

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## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	7
4 Assessment of access level.....	12
4.1 General.....	12
4.2 Determination of access level and the use of Condition 2.....	13
4.3 Access level 1 and 1M.....	14
4.4 Access level 2 and 2M.....	15
4.5 Access level 3R.....	16
4.6 Access level 3B.....	16
4.7 Access level 4.....	16
4.8 Time base.....	17
5 Classification and evaluation of access level.....	17
5.1 General.....	17
5.2 Impact of using automatic power reduction features.....	18
5.3 Automatic power reduction mechanisms (APR).....	18
5.3.1 General.....	18
5.3.2 APR performance requirements.....	18
5.4 Installation protection systems (IPS).....	19
6 Access level and classification requirements by location type.....	19
6.1 General.....	19
6.2 Requirements for unrestricted locations .....	22
6.2.1 General .....	22
6.2.2 Use of access level 1M and access level 2M FSOCS equipment in unrestricted locations.....	24
6.2.3 Use of access level 3R FSOCS equipment in unrestricted locations .....	26
6.3 Requirements for restricted locations .....	26
6.3.1 General .....	26
6.3.2 Use of access level 3R FSOCS equipment in restricted locations .....	27
6.4 Requirements for controlled locations .....	28
6.4.1 General .....	28
6.4.2 Use of access level 3B and access level 4 FSOCS equipment in controlled locations.....	29
6.5 Requirements for inaccessible space .....	29
6.6 Specular reflections .....	29
7 Organizational requirements.....	30
7.1 Requirements for manufacturers of ready-to-use FSOCS transmitter or turn key systems.....	30
7.1.1 General .....	30
7.1.2 Additional manufacturer's requirements .....	31
7.2 Installation and service organization requirements .....	32
7.3 Operating organization requirements .....	33
8 Marking .....	33
8.1 General.....	33
8.2 Marking of aperture for transmitter.....	35

8.3	Durability – Indelibility requirements for safety markings .....	35
8.4	Warning for invisible radiation .....	35
Annex A	(informative) Rationale .....	36
Annex B	(informative) Clarification of the meaning of "access level" .....	37
B.1	General .....	37
B.2	Class .....	37
B.3	Access level .....	37
Annex C	(informative) Examples of applications and calculations .....	38
C.1	Symbols used in the example of this annex .....	38
C.2	Examples of NHZ and ENHZ .....	38
C.2.1	General .....	38
C.2.2	Example – Collimated beam access level 1M FSOCS .....	38
C.2.3	Example – Diverging beam access level 1M FSOCS .....	39
C.2.4	Example – Access level 3B FSOCS product .....	39
C.3	Viewing a specular (mirror-like) reflection .....	40
C.4	Example of divergent, diffuse IR transmitter .....	41
C.5	FSOCS link between two restricted locations .....	42
C.6	Unmanned (uncrewed) Aerial (aircraft) system (UAS) .....	45
Annex D	(informative) Methods of hazard/safety analysis .....	48
Annex E	(informative) Guidance for installing, servicing and operating organizations .....	49
E.1	Working practices for FSOCSs .....	49
E.1.1	General .....	49
E.1.2	General working practices .....	49
E.1.3	Additional working practices for Class/access level 1M, 2M, 3R, 3B and 4 systems .....	50
E.2	Education and training .....	50
Bibliography	.....	51
Figure 1	– Commercial structures .....	20
Figure 2	– Residential areas .....	21
Figure 3	– Examples of external location types .....	23
Figure 4	– Access level 1M or 2M transmitter near edge of unrestricted rooftop .....	25
Figure 5	– Access level 1M transmitter in unrestricted location .....	25
Figure 6	– Access level 3R transmitter in restricted location .....	28
Figure C.1	– Link between two widely separated locations .....	42
Figure C.2	– Unmanned (uncrewed) Aerial (aircraft) System with FSOCS .....	45
Figure C.3	– Grounded FSOCS installed to the ground .....	46
Figure C.4	– Grounded FSOCS installed to the controlled location .....	46
Table 1	– Measurement aperture diameters and distances for the default (simplified) evaluation .....	14
Table 2	– Restrictions for the use of FSOCS based on access levels .....	22
Table 3	– Requirements for warning signs .....	32
Table 4	– Marking requirements .....	34
Table C.1	– Symbols used in the example of Annex C .....	38
Table C.2	– Allowed access levels and installation requirements .....	47

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF LASER PRODUCTS –****Part 12: Safety of free space optical communication systems  
used for transmission of information**

## 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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IEC 60825-12 has been prepared by IEC technical committee 76: Optical radiation safety and laser equipment. It is an International Standard.

This third edition cancels and replaces the second edition published in 2019. This edition constitutes a technical revision.

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

- a) Where relevant and appropriate, references to IEC 60825-1 have been changed to a specific dated reference i.e. IEC 60825-1:2014.
- b) Condition 2 has been changed from 7 mm aperture stop and 70 mm distance as follows,
  - For wavelengths less than 1 400 nm, 3,5 mm aperture stop and 35 mm distance,
  - For wavelengths equal to or greater than 1 400 nm, 3,5 mm aperture stop and 14 mm distance.

- c) For wavelengths between 1 200 nm and 1 400 nm, an additional limitation is required equal to the equivalent radiant power of the skin MPE.  $C_7$  has therefore been revised in accordance with IEC 60825-1:2014, but with this additional limitation related to the skin MPE; see 4.2.
- d) Additional detail added regarding time base, see 4.8.
- e) Additional clarification added to Clause 8 regarding the content and formatting of labels.
- f) Annex A has been added, providing a rationale for the differences in approach between this document and IEC 60825-1:2014.
- g) Annex B has been added, providing clarification of the meaning of the term "access level".
- h) Worked examples have been added for a variety of scenarios; see Clauses C.2 to C.5.
- i) Clause C.6 has been added on UAS, unmanned aerial systems.

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

Draft	Report on voting
76/717/FDIS	76/722/RVD

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

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

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

The list of all parts of the IEC 60825 series, published under the title *Safety of laser products*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**IMPORTANT – The "colour inside" logo on the cover page of this document 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.**

The contents of the corrigenda 1 (2024-07) and 2 (2026-01) have been included in this copy.

## INTRODUCTION

The objective of this document is to:

- protect people from hazardous optical radiation emitted by FSOCSs;
- provide safety requirements and guidance for the design, manufacture and use of laser products or laser systems, which emit laser radiation for the purpose of free space optical data transmission;
- provide guidance for installation, operation, maintenance and service to assure the safe deployment and use of such laser systems.

This document only addresses the open beam portion of the laser product or laser system.

This document places the responsibility for certain product safety requirements, as well as requirements for providing appropriate information on how to use these systems safely, on the manufacturer of the system or the transmitters. It places the responsibility for the safe deployment and use of these systems on the installer or the operating organization. It places the responsibility for adherence to safety instructions during installation and service operations on the installation and service organizations as appropriate, and during operation and maintenance functions on the operating organization. It is recognized that the user of this document may fall into one or more of the categories of manufacturer, installer, service organization and/or operating organization as mentioned above.

Annex A gives a more detailed rationale for this document, and some examples are given in Annex C.

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## SAFETY OF LASER PRODUCTS –

### Part 12: Safety of free space optical communication systems used for transmission of information

#### 1 Scope

This part of IEC 60825 is applicable to products that emit laser radiation for the purpose of free space optical data transmission.

This document does not apply to laser products designed for the purposes of transmitting optical power for applications such as material processing or medical treatment. This document also does not apply to the use of laser products in explosive atmospheres (see IEC 60079-0). Light-emitting diodes employed by free space optical communication systems, used for the purpose of free space optical data transmission, do not fall into the scope of this document.

NOTE If the laser product incorporates an optical fibre that extends from the confinements by a system or enclosed space, the requirements in IEC 60825-2 apply.

#### 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 60825-1:2014, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCSs)*

#### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60825-1:2014 and the following apply.

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

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

##### 3.1

##### access level

potential hazard at any accessible position as a result of the optical emissions from a free space optical communication system (FSOCS) installation

Note 1 to entry: The access level is based on the level of laser radiation which could become accessible in reasonably foreseeable circumstances, e.g. walking into an open beam path. It is closely related to the laser classification procedure in IEC 60825-1. The meaning of access level is clarified in Annex B.

Note 2 to entry: Practically speaking, it takes two or more seconds to fully align an optical aid with a beam (which might occur in an unrestricted location), and this delay is incorporated into the method for determining access level.

### 3.2

#### access level 1

assigned hazard at any accessible location within a FSOCS at which, under any reasonably foreseeable event, human access to laser radiation (accessible emission), evaluated by the measurement conditions for access level 1 as defined in Clause 4 of this document, will not exceed the accessible emission limits of Class 1 for the applicable wavelengths and emission duration, with additional constraints as defined in 4.3

Note 1 to entry: The "additional constraints" mentioned above refer to additional and stricter constraints that 4.3 of this document places on the values specified in IEC 60825-1:2014 for the accessible emission limits of Class 1 in the wavelength range 1 200 to 1 400 nm.

### 3.3

#### access level 1M

assigned hazard at any accessible location within a FSOCS at which, under any reasonably foreseeable event, human access to laser radiation (accessible emission), evaluated by the measurement conditions for access level 1M as defined in Clause 4 of this document, will not exceed the accessible emission limits of Class 1 for the applicable wavelengths and emission, with additional constraints as defined in 4.3

Note 1 to entry: The "additional constraints" mentioned above refer to additional and stricter constraints that 4.3 of this document places on the values specified in IEC 60825-1:2014 for the accessible emission limits of Class 1 in the wavelength range 1 200 to 1 400 nm.

### 3.4

#### access level 2

assigned hazard at any accessible location within a FSOCS at which, under any reasonably foreseeable event, human access to laser radiation (accessible emission), evaluated by the measurement conditions for access level 2 as defined in Clause 4 of this document, will not exceed the accessible emission limits of Class 2 for the applicable wavelengths and emission duration, with additional constraints as defined in 4.4

### 3.5

#### access level 2M

assigned hazard at any accessible location within a FSOCS at which, under any reasonably foreseeable event, human access to laser radiation (accessible emission), evaluated by the measurement conditions for access level 2M as defined in Clause 4 of this document, will not exceed the accessible emission limits of Class 2 for the applicable wavelengths and emission duration, with additional constraint as defined in 4.4

### 3.6

#### access level 3R

assigned hazard at any accessible location within a FSOCS at which, under any reasonably foreseeable event, human access to laser radiation (accessible emission), evaluated by the measurement conditions for access level 3R as defined in Clause 4 of this document, will not exceed the accessible emission limits of Class 3R for the applicable wavelengths and emission duration, with additional constraints as defined in 4.5

Note 1 to entry: The "additional constraints" mentioned above refer to additional and stricter constraints that 4.5 of this document places on the values specified in IEC 60825-1:2014 for the accessible emission limits of Class 1 in the wavelength range 1 200 to 1 400 nm.

### 3.7

#### access level 3B

assigned hazard at any accessible location within a FSOCS at which, under any reasonably foreseeable event, human access to laser radiation (accessible emission), evaluated by the measurement conditions for access level 3B as defined in Clause 4 of this document, will not exceed the accessible emission limits of Class 3B for the applicable wavelengths and emission duration, with additional constraints as defined in 4.6

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### 3.8

#### access level 4

assigned hazard at any accessible location within a FSOCS at which, under any reasonably foreseeable event, human access to laser radiation (accessible emission), evaluated by the measurement conditions for access level 4 as defined in Clause 4 of this document, will exceed the accessible emission limits of Class 3B for the applicable wavelengths and emission duration, with additional constraints as defined in 4.7

Note 1 to entry: This document is applicable to the conditions of operation and maintenance of FSOCS. In order to achieve an adequate level of safety for persons who may come into contact with the optical transmission path, access level 4 is not permitted by this document. It is permitted to use protection systems, such as automatic power reduction (APR, see 3.10) or installation protection system (IPS: see 3.17), to achieve the required access level where the transmitted power under any operating conditions (e.g. normal and fault operation) exceeds that permitted for a particular location type. For instance, it is possible for accessible parts of an FSOCS to be access level 1 even though the power transmitted down the free space under normal operating conditions is Class 4.

### 3.9

#### aperture for transmitter

the window or laser transmissive port of FSOCS through which the beam is emitted into free space

### 3.10

#### automatic power reduction

##### APR

feature of a transmitter of an FSOCS, provided by the system equipment manufacturer, by which the accessible power in the nominal hazard zone (NHZ) or extended nominal hazard zone (ENHZ) is reduced to a specified value within a specified time

Note 1 to entry: The term "automatic power reduction" (APR) used in this document encompasses the following terms used in the International Telecommunication Union (ITU) Recommendation G.664:

- automatic laser shutdown (ALS);
- automatic power reduction (APR);
- automatic power shutdown (APSD).

### 3.11

#### beacon

optical source whose function is to aid in pointing or alignment of an FSOCS transmitter and/or receiver

### 3.12

#### end-to-end system

FSOCS that is comprised of at least one transmitter, one receiver, and any peripheral hardware necessary for the effective transfer of data along the transmission path from one position in space to another

### 3.13

#### extended nominal hazard zone

##### ENHZ

volume of space within which, when optical aids are used, the level of eye exposure to direct, reflected or scattered radiation exceeds the applicable maximum permissible exposure (MPE) as defined in IEC 60825-1:2014

Note 1 to entry: Exposure levels outside the boundary of the ENHZ are below the applicable MPE when optical aids are used.

Note 2 to entry: This volume is determined prior to activation of any IPS or APR systems unless the APR is used for classification under the conditions of Clause 5 of this document.