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Safety of laser products –

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



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

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

FDIS	Report on voting
76/281/FDIS	76/285/RVD

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

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

IEC consists of the following parts, under the general title: *Safety of laser products*:

- Part 1: Part 1: Equipment classification, requirements and user's guide
- Part 2: Safety of optical fibre communication systems
- Part 3: Guidance for laser displays and shows
- Part 4: Laser guards
- Part 5: Manufacturer's checklist for IEC 60825-1
- Part 6: Safety of products with optical sources, exclusively used for visible information transmission to the human eye
- Part 7: Safety of products emitting infrared optical radiation, exclusively used for wireless 'free air' data transmission and surveillance
- Part 8: Guidelines for the safe use of medical laser equipment
- Part 9: Compilation of maximum permissible exposure to incoherent optical radiation
- Part 10: Application guidelines and explanatory notes to IEC 60825-1
- Part 12: Safety of free space optical communication systems used for transmission of information

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

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- withdrawn;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

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 provides requirements and specific guidance for the manufacture and safe use of laser products and systems used for point-to-point or point-to-multipoint free space optical data transmission. This standard only addresses the open beam portion of the system. If portions of the equipment or system incorporate optical fibre that extends from the confinements of the enclosure(s), the manufacturing and safety requirements under IEC 60825-1 apply to those portions only. This standard does not apply to systems designed for purposes of transmitting optical power for applications such as material processing or medical treatment. This standard also does not apply to the use of systems in explosive atmospheres.

Throughout this part of IEC 60825, light-emitting diodes (LEDs) are included whenever the word “laser” is used.

The objective of this part of IEC 60825 is to:

- provide information to protect people from potentially hazardous optical radiation produced by free space optical communication systems (FSOCS) by specifying engineering controls and requirements, administrative controls and work practices according to the degree of the hazard;
- specify requirements for manufacturing, installation, service and operating organisations in order to establish procedures and provide written information so that proper precautions can be adopted.

Because of the nature of FSOCS, also known as optical wireless or free-air information transmission systems, care must be taken in their manufacture as well as their installation, operation, maintenance and service to assure the safe deployment and use of these systems. This standard 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 and/or transmitters. It places the responsibility for the safe deployment and use of these systems on the installer and/or operating organisation. It places the responsibility for adherence to safety instructions during installation and service operations on the installation and service organisations as appropriate, and during operation and maintenance functions on the operating organisation. It is recognised that the user of this standard may fall into one or more of the categories of manufacturer, installer, service organisation and/or operating organisation as mentioned above.

Any laser product is exempt from all further requirements of this part of IEC 60825 if

- classification by the manufacturer according to IEC 60825-1 shows that the emission level does not exceed the accessible emission limit (AEL) of Class 1 under all conditions of operation, maintenance, service and failure, and
- it does not contain an embedded laser product.

2 Normative references

The following referenced documents are indispensable for the application 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 60825-1:1993, *Safety of laser products – Part 1: Equipment classification, requirements and user's guide*¹
Amendment 1 (1997)
Amendment 2 (2001)

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

3 Terms and definitions

3.1

access level

potential hazard at any accessible position associated with a free space optical communication system (FSOCS) installation

NOTE 1 The access level is based on the level of optical 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.

NOTE 2 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

level for which, under reasonably foreseeable circumstances, human access to laser radiation in excess of the accessible emission limits (AEL) of Class 1 for the applicable wavelengths and emission duration will not occur

3.3

access level 1M

level for which, under reasonably foreseeable circumstances, human access to laser radiation in excess of the accessible emission limits (AEL) of Class 1M for the applicable wavelengths and emission duration will not occur

NOTE If the applicable limit of access level 1M is larger than the limit of 3R and less than the limit of 3B, access level 1M is allocated.

3.4

access level 2

level for which, under reasonably foreseeable circumstances, human access to laser radiation in excess of the accessible emission limits of Class 2 for the applicable wavelengths and emission duration will not occur

3.5

access level 2M

level for which, under reasonably foreseeable circumstances, human access to laser radiation in excess of the accessible emission limits of Class 2M for the applicable wavelengths and emission duration will not occur

NOTE If the applicable limit of access level 2M is larger than the limit of 3R and less than the limit of 3B, access level 2M is allocated.

¹⁾ A consolidated edition (1.2) exists comprising IEC 60825-1 (1993) and its Amendments 1 (1997) and 2 (2001).