INTERNATIONAL STANDARD

IEC 60825-2

Second edition
2000-05

Safety of laser products –

Part 2:
Safety of optical fibre communication systems

Sécurité des appareils à laser –

Partie 2:
Sécurité des systèmes de télécommunication par fibres optiques

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* See web site address on title page.

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Safety of laser products

Part 2: Safety of optical fibre communication systems

INTERPRETATION SHEET 1

General instruction for all normative clauses, including annex B:

Replace “Hazard Level 2 “ *with* “Hazard level 2 or Hazard level 2M, as appropriate”.

Replace “Hazard Level 3A” *with* “Hazard Level 1M or Hazard Level 3R, as appropriate”.

In Annex B, 3B Hazard Level, controlled location column, replace “Hazard Level kx3A” with “Hazard Level 1M or 2M.”

Delete all remaining references to “Hazard Level kx3A”.

All classification and hazard level evaluations shall be made in accordance with IEC 60825-1, Amendment 2.

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4.4.2

In table 1, the limiting aperture values for IEC 60825-1, Amendment 2 shall be substituted.

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Annexes

Delete all informative annexes.

Replace old annex B by the following new annex A:

Annex A
(normative)

Summary of engineering requirements at locations in optical fibre communication system

Hazard level	Location type		
	Unrestricted	**Restricted**	**Controlled**
1	No requirements	No requirements	No requirements
1M	1) Labelling, and 2) Class 1* from connector or connector requires tool	Labelling	Labelling
2 and 2M	1) Labelling, and 2) Class 1* from connector, or connector requires tool	Labelling	Labelling
3R	Not permitted **	1) Labelling, and 2) Class 1M* from connector, or connector requires tool	1) Labelling, and 2) class 1M or 2M* from connector or connector requires tool
3B	Not permitted **	Not permitted**	1) Labelling, and 2) Protected cables, and 3) class 1M or 2M* from connector or connector requires tool
4	Not permitted **	Not permitted **	Not permitted**

* To be achieved by mechanical design of connector, automatic power reduction or other suitable means.

** See 4.4.3. Where systems employ power levels of class 3R or more, protection systems such as APR may be used to obtain the acceptable hazard level for the particular location type.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SAFETY OF LASER PRODUCTS –

Part 2: Safety of optical fibre communication systems

FOREWORD

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International Standard IEC 60825-2 has been prepared by IEC technical committee 76: Optical radiation safety and laser equipment.

This second edition cancels and replaces the first edition published in 1993 and amendment 1 (1997). This second edition constitutes a technical revision.

The text of this standard is based on the first edition, amendment 1 and the following documents:

FDIS	Report on voting
76/208/FDIS	76/211/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 3.

IEC 60825-2 constitutes part 2 of a series of publications under the general title: Safety of laser products.

Annex B forms an integral part of this standard.

Annexes A, C, D and E are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2003. At this date, the publication will be

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

A bilingual version of this standard may be issued at a later date.

SAFETY OF LASER PRODUCTS –

Part 2: Safety of optical fibre communication systems

1 Scope

This part 2 of IEC 60825 provides requirements and specific guidance for the safe use of optical fibre and/or control communication systems where optical power may be accessible at great distance from the optical source. It does not apply to optical fibre systems primarily designed to transmit optical power for applications such as material processing or medical treatment.

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

The objective of this part 2 of IEC 60825 is to:

– protect people from optical radiation resulting from optical fibre communication systems. This requires the introduction of engineering requirements and work practices according to the degree of hazard;

– lay down requirements for manufacturers and operating organizations in order to establish procedures and supply information so that proper precautions can be adopted;

– ensure adequate warning to individuals of the hazards associated with optical fibre communication systems through signs, labels and instructions;

– reduce the possibility of injury by minimizing unnecessary accessible radiation, give improved control of the optical radiation through protective features and provide safe usage of products by specifying user control measures.

Annex A gives a more detailed rationale for this part of IEC 60825.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60825. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60825 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60794-2:1989, *Optical fibre cables – Part 2: Product specifications*

IEC 60825-1:1993, S*afety of laser products – Part 1: Equipment classification, requirements and user's guide*

3 Definitions

For the purpose of this part of IEC 60825, the following definitions apply. They are in addition to those given in IEC 60825-1.

3.1
accessible location
any part within an optical fibre communication system at which, under reasonably foreseeable circumstances, human access to laser radiation is possible

3.2
automatic power reduction
feature of an optical fibre communication system by which the accessible power is reduced to a specified level within a specified time, whenever there is an event which could result in human exposure to radiation, e.g. a fibre cable break

3.3
enclosed system
system in which, during normal operation, the optical radiation is totally enclosed, e.g. by light-proof cabinets, components, total internal reflection or optical fibre cables and connectors

3.4
end-user
person/organization using the optical fibre communication system in the manner the system was designed to be used. The user cannot necessarily control the power generated and transmitted within the system

3.5
hazard level
potential hazard at any accessible location within an optical fibre communication system. It is based on the level of optical radiation which could become accessible in reasonably foreseeable circumstances, e.g. a fibre cable break. It is closely related to the laser classification procedure in IEC 60825-1

3.6
hazard level 1
hazard level 1 is allocated to any accessible location within an optical fibre communication system at 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

3.7
hazard level 2
hazard level 2 is allocated to any accessible location within an optical fibre communication system at 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

3.8
hazard level 3A
hazard level 3A is allocated to any accessible location within an optical fibre communication system at which, under reasonably foreseeable circumstances, human access to laser radiation in excess of the accessible emission limits of class 3A for the applicable wavelengths and emission duration will not occur

3.9
hazard level *k* × 3A
in the wavelength range 400 nm to 4 000 nm, a hazard level $k \times 3A$ is allocated to any accessible location within an optical fibre communication system at which, under reasonably foreseeable circumstances, human access to laser radiation in excess of the accessible emission limits of hazard level $k \times 3A$ for the applicable wavelengths and emission duration will not occur. For purposes of the $k \times 3A$ hazard level evaluation, class 3A AEL table is used; the minimum measurement distance shall be increased to 250 mm from the apparent source and the time base used shall be 10 s, provided longer viewing durations are not reasonably foreseeable. For wavelengths greater than 1 400 mm, the radiant power limit shall be a factor of 10 greater than for class 1

NOTE The value of *k* is not a constant and need not be calculated (see annex A for rationale).

3.10
hazard level 3B
hazard level 3B is allocated to any accessible location within an optical fibre communication system at which, under reasonably foreseeable circumstances, human access to laser radiation in excess of the accessible emission limits of class 3B for the applicable wavelengths and emission duration will not occur

3.11
hazard level 4
hazard level 4 is allocated to any accessible location within an optical fibre communication system at which, under reasonably foreseeable circumstances, human access to laser radiation in excess of the accessible emission limits of class 3B for the applicable wavelengths and emission duration may occur

3.12
light emitting diode (LED)
any semiconductor p-n junction device which can be made to produce electromagnetic radiation by radiative recombination in the semiconductor, in the wavelength range from 180 nm to 1 mm. (The optical radiation is produced primarily by the process of spontaneous emission, although some stimulated emission may be present.)

3.13
local operator control
an optical communication system is under local operator control if the operating controls and the optical output may be directly monitored simultaneously by a single operator who has control over the potential human access to optical radiation

3.14
location with controlled access
location where access to the protective housing (enclosure) is controlled and is accessible only to authorized persons who have received adequate training in laser safety and the servicing of the system involved. Examples include optical cable ducts and switching centres

3.15
location with restricted access
location where access to the protective housing (enclosure) is restricted and not open to the public. Examples include industrial and commercial premises

3.16
location with unrestricted access
location where access to the protective housing (enclosure) is unrestricted. Examples include domestic premises and premises open to the public

3.17
manufacturer
organization/individual who assembles optical devices and other components in order to construct or modify an optical fibre communication system

3.18
operating organization
organization/individual who is responsible for the installation and/or operation of an optical fibre communication system

3.19
optical fibre communication system
engineered assembly for the generation, transference and reception of optical radiation arising from lasers, in which the transference is by means of optical fibre for communication and/or control purposes

3.20
reasonably foreseeable event
event the occurrence of which under given circumstances can be predicted fairly accurately, and the occurrence probability or frequency of which is not low or very low.

Examples of reasonably foreseeable events might include the following: component failure, fibre cable break, optical connector disconnection, operator error or inattention to safe working practices.

Reckless use or use for completely inappropriate purposes is not to be considered as a reasonably foreseeable event

3.21
protected cable
a cable in which the fibre or fibres are contained within a robust sheath which permits normal handling without breakage and/or exposure of the fibre ends. See also 4.1.2.2 and annex B

3.22
subassembly
any discrete unit of an optical fibre communication system which contains an optical emitter or optical amplifier

4 Manufacturing requirements

4.1 Engineering specifications

4.1.1 General remarks

Optical fibre communication systems require certain built-in safety features, depending on their hazard level. The manufacturer of the optical fibre communication system is responsible for the allocation of the hazard level and for compliance with the manufacturing requirements. These requirements are summarized in annex B.

Whenever alterations which may affect hazard levels are made to the optical fibre communication system, the person or organization performing such a modification shall reassess the hazard levels by carrying out tests and measurements, wherever appropriate, for ensuring compliance and, where the hazard level has changed, relabelling.

Manufacturers of ready-for-use optical fibre communication systems which are to be supplied to end-users are responsible for assessing the hazard levels of the optical system under all reasonably foreseeable circumstances and for compliance with the appropriate manufacturing and safety requirements.