SLOVENSKI STANDARD

SIST EN 60825-4:1999/A2:2004

01-januar-2004

Safety of laser products - Part 4: Laser guards - Amendment 2 (IEC 60825-4:1997/A2:2003)

Safety of laser products -- Part 4: Laser guards

Sicherheit von Lasereinrichtungen -- Teil 4: Laserschutzwnde

Scurit des appareils laser -- Partie 4: Protecteurs pour lasers

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Ta slovenski standard je istoveten z: **EN 60825-4:1997/A2:2003**

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ICS:

13.280	Varstvo pred sevanjem	Radiation protection
31.260	Optoelektronika, laserska oprema	Optoelectronics. Laser equipment

SIST EN 60825-4:1999/A2:2004 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD **EN 60825-4/A2**

NORME EUROPÉENNE

EUROPÄISCHE NORM October 2003

ICS 31.260

English version

Safety of laser products
Part 4: Laser guards
(IEC 60825-4:1997/A2:2003)

Sécurité des appareils à laser
Partie 4: Barrières laser
(CEI 60825-4:1997/A2:2003)

Sicherheit von Laser-Einrichtungen
Teil 4: Laserschutzwände
(IEC 60825-4:1997/A2:2003)

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This amendment A2 modifies the European Standard EN 60825-4:1997; it was approved by CENELEC on 2003-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Ref. No. EN 60825-4:1997/A2:2003 E

Foreword

The text of document 76/263/FDIS, future amendment 2 to IEC 60625-4:1997, prepared by IEC TC 76, Optical radiation safety and laser equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60625-4:1997 on 2003-10-01.

The following dates were fixed:

– latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2004-07-01

– latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2006-10-01

This European Standard was prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and supports the essential requirements of Directive 1999/5/EC.

Annexes designated "informative" are given for information only.
In this standard, annex E is informative.

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Endorsement notice

The text of amendment 2:2003 to the International Standard IEC 60625-4:1997 was approved by CENELEC as an amendment to the European Standard without any modification.

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In the official version, for Bibliography, the following note has to be added for the standard indicated:

ISO 10218	NOTE	Harmonized as EN 775:1992 (modified).

INTERNATIONAL STANDARD

IEC 60825-4

1997

AMENDMENT 2
2003-07

Amendment 2

Safety of laser products –

Part 4: Laser guards

Amendement 2

Sécurité des appareils à laser –

Partie 4:
Barrières laser

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International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE M

For price, see current catalogue

FOREWORD

This amendment has been prepared by IEC technical committee 76: Optical radiation safety and laser equipment.

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

FDIS	Report on voting
76/263/FDIS	76/273/RVD

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until 2005. At this date, the publication will be

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

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Add the following to the existing table of contents:

Annex E (informative) Guidelines on the arrangement and installation of laser guards

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Add, after Annex D, the new Annex E as follows:

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Annex E
(informative)

Guidelines on the arrangement and installation of laser guards

E.1 Overview

This informative annex addresses the arrangement and installation of guards to protect personnel against laser radiation hazards around the process zone of a laser materials processing machine. These guidelines are for use by manufacturers and/or users. The object of the annex is to encompass guarding for a stand-alone laser-processing machine (see ISO 11553[1]) and additional (often user-installed) guarding required to safely integrate a laser-processing machine. Guarding issues relating to associated hazards of laser processing (which include mechanical, electrical, fume and secondary radiation hazards) are not considered in detail in this annex.

E.2 General

E.2.1 Introduction

Laser guarding is required to isolate the laser hazard in addition to the associated hazards of laser processing. Some of the guards may form part of a laser-processing machine, additional guarding may be used to facilitate safe loading and unloading of workpieces, and for servicing.

E.2.2 Arrangement of guards

Key elements in assessing the arrangement and installation of guards around the process zone include:

a) the degree of accessibility required for workpiece handling (especially the degree of manual manipulation);

b) the method of fixing the workpiece (e.g. use of jigs and clamps);

c) the method of removal of the workpiece and any associated parts (e.g. scrap) after processing.

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E.2.3 Location of guards

Good practice in determining the location of laser guards includes:

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- the laser guard should be located at least 3 focal lengths away from the focal point of a focussing lens;
- laser guards with lower protective exposure limits (PELs), for example viewing windows, should not be located where the direct beam or specular reflections are expected.

E.2.4 Complete enclosure

A complete enclosure is one which meets all the requirements for a protective housing as specified in Clause 4.2.1 of IEC 60825-1 and encompasses the embedded laser and the entire process zone, such that there is no human access to hazardous radiation.

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1 Also published by the European Committee for Standardization as EN 12626.

E.2.5 Incomplete enclosure

An incomplete enclosure is one which does not provide a complete protective housing encompassing the embedded laser and the entire process zone, such that human access to hazardous radiation is possible.

If the risk of exposure is not tolerable, (to those who may be on walkways or platforms which raise them above the guards of an open topped machine) additional control measures are required.

E.2.6 Hierarchy of control of laser hazard areas

The following hierarchy of measures is recommended for keeping persons out of an area where there is an intolerable risk:

a) fit a fixed guard;

b) fit a removable guard;

c) fit an electronic protection device linked to the safety interlock chain of the machine, around the perimeter of the area (e.g. a light beam sensor) or over the area (e.g. a pressure mat);

d) provide a physical barrier plus information, instruction, training, supervision;

e) provide a means of allowing use with the operator some distance from the process zone plus personal protective equipment (PPE).

NOTE Measures (c) and (d) provide no protection from laser radiation emerging from the laser machine and should therefore only be considered where the distance of the controlled boundary from openings in the machine exceeds the "Nominal Ocular Hazard Distance" (NOHD).

E.2.7 Personal protective equipment

Personal protective equipment should only be used as a last resort where a combination of engineering and administrative controls cannot reasonably provide a sufficient level of protection. Where personal protective equipment is employed it should be supported with an adequate level of administrative control governing its use. It should only be used when a risk assessment has shown that the use of other means of risk reduction has failed to produce a sufficient degree of safety and when it is not reasonably practicable to ensure adequate protection by other means. When working with UVB and UVC, protective clothing may be required.

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E.2.8 Human intervention

Where machine operations require a human access, then human intervention can be included in the risk assessment and the consideration of implications for the duration of the fault condition. Under these conditions access should be controlled and accessible only to authorised persons who have received adequate training in laser safety and servicing of the laser system involved. The area should also be restricted and not open to the public and where observers or other untrained personnel are kept from being exposed to the hazards by barriers or administrative controls.

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E.3 Risk assessment

E.3.1 Introduction

Human exposure to a laser beam of the type typically used in laser materials processing can produce a moderate to severe injury, depending on laser wavelength, tissue exposed and the response of the victim. The probability of such an exposure occurring becomes the key variable element in assessing the risk of injury. The reduction of risk to tolerable levels is an iterative process. There is no standard approach to procedure and documentation for this process. Nevertheless, the steps involved are universal and are described in EN 1050.

E.3.2 General considerations

A risk assessment should be performed to identify hazardous situations and to assess the foreseeable exposure level on intended positions of a laser guard. This assessment should take into account a number of factors, including the following.

E.3.2.1 Features of the laser process zone

Relevant features include the laser power and wavelength, the focal length of optics, the degrees of freedom of the beam delivery (e.g. number of axes of movement).

E.3.2.2 Process

The nature of the process, such as cutting, drilling, welding, marking. The machine may be dedicated or offer several processes.

NOTE Reflected laser powers differ appreciably with process and material being processed.

E.3.2.3 Process control

This factor addresses in particular the time during which laser guards may be exposed under fault conditions, including those upon which the foreseeable exposure limit (FEL) is determined (e.g. the process cycle time), the inspection process (e.g. per item or per time period/ number of items), and the means and effectiveness of automatic process control intervention in the event of a fault condition becoming evident.

E.3.2.4 Manual operations

Operator intervention considerations include the need and provision for manual control, the means and effectiveness of process observation (including the location of viewing windows or cameras) and the accessibility and effectiveness of intervention in the event of a fault condition becoming evident.

E.3.2.5 Robot operations

The full range of robot movements, impact protection for the robot head and general protection of service lines and the beam delivery to the robot, and the means of limiting robot head movement and direction (e.g. software limits, hardware limits and physical limits), in particular the closest approach of the exposed laser beam to laser guards.

E.3.2.6 Workpiece

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The geometry, composition and surface finish of the workpiece, and how it can affect the direction and strength of reflections during laser processing.

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E.3.2.7 Clamping and fixturing

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The holding and positioning of the workpiece and the related issues of reflections from surfaces and collisions of the focussing head.

E.3.2.8 Loading and unloading

The method by which the workpiece is introduced and removed, in particular whether it is manual or automatic, single piece or continuous, and the method (e.g. sliding, rolling or lifting door) and control of access to the process zone.