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Standards

Irish Standard  
I.S. EN 60825-4:2006

# Safety of laser products -- Part 4: Laser guards (IEC 60825-4:2006 (EQV))

## I.S. EN 60825-4:2006

*Incorporating amendments/corrigenda issued since publication:*

EN 60825-4:2006/A1:2008  
EN 60825-4:2006/A2:2011

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<i>This document replaces:</i> EN 60825-4:1997 + A1:2002 + A2:2003	<i>This document is based on:</i> EN 60825-4:2006	<i>Published:</i> 27 October, 2006
This document was published under the authority of the NSAI and comes into effect on:  24 November, 2006		ICS number: 31.260
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Údarás um Chaighdeáin Náisiúnta na hÉireann		

ICS 31.260

English version

**Safety of laser products -  
Part 4: Laser guards**  
(IEC 60825-4:2006/A2:2011)

Sécurité des appareils à laser -  
Partie 4: Protecteurs pour lasers  
(CEI 60825-4:2006/A2:2011)

Sicherheit von Lasereinrichtungen -  
Teil 4: Laserschutzwände  
(IEC 60825-4:2006/A2:2011)

This amendment A2 modifies the European Standard EN 60825-4:2006; it was approved by CENELEC on 2011-05-03. 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.

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, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

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**I.S. EN 60825-4:2006**

EN 60825-4:2006/A2:2011

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**Foreword**

The text of document 76/428/CDV, future amendment 2 to IEC 60825-4:2006, 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 60825-4:2006 on 2011-05-03.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) 2012-02-03
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2014-05-03

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**Endorsement notice**

The text of amendment 2:2011 to the International Standard IEC 60825-4:2006 was approved by CENELEC as an amendment to the European Standard without any modification.

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ICS 31.260

English version

**Safety of laser products -  
Part 4: Laser guards**  
(IEC 60825-4:2006/A1:2008)

Sécurité des appareils à laser -  
Partie 4: Protecteurs pour lasers  
(CEI 60825-4:2006/A1:2008)

Sicherheit von Lasereinrichtungen -  
Teil 4: Laserschutzwände  
(IEC 60825-4:2006/A1:2008)

This amendment A1 modifies the European Standard EN 60825-4:2006; it was approved by CENELEC on 2008-09-01. 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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**I.S. EN 60825-4:2006**

EN 60825-4:2006/A1:2008

- 2 -

**Foreword**

The text of document 76/383/FDIS, future amendment 1 to IEC 60825-4:2006, 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 A1 to EN 60825-4:2006 on 2008-09-01.

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) 2009-06-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2011-09-01

Annex ZA has been added by CENELEC.

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**Endorsement notice**

The text of amendment 1:2008 to the International Standard IEC 60825-4:2006 was approved by CENELEC as an amendment to the European Standard without any modification.

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**Replace Annex ZA of EN 60825-4:2006 by:**

**Annex ZA**  
(normative)

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

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60825-1	2007	Safety of laser products - Part 1: Equipment classification and requirements	EN 60825-1	2007
ISO 11553-1	2005	Safety of machinery - Laser processing machines - Part 1: General safety requirements	EN ISO 11553-1	2005
ISO 12100-1	2003	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology	EN ISO 12100-1	2003
ISO 12100-2	2003	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles	EN ISO 12100-2	2003
ISO 13849-1	2006	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	EN ISO 13849-1	2008
ISO 14121-1	2007	Safety of machinery - Risk assessment - Part 1: Principles	EN ISO 14121-1	2007

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EUROPEAN STANDARD

**EN 60825-4**

NORME EUROPÉENNE

October 2006

EUROPÄISCHE NORM

ICS 31.260

Supersedes EN 60825-4:1997 + A1:2002 + A2:2003

English version

**Safety of laser products**  
**Part 4: Laser guards**  
(IEC 60825-4:2006)

Sécurité des appareils à laser  
Partie 4: Protecteurs pour lasers  
(CEI 60825-4:2006)

Sicherheit von Lasereinrichtungen  
Teil 4: Laserschutzwände  
(IEC 60825-4:2006)

This European Standard was approved by CENELEC on 2006-10-01. 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 Central Secretariat or to any CENELEC member.

This European Standard 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, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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European Committee for Electrotechnical Standardization  
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**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

**I.S. EN 60825-4:2006**

EN 60825-4:2006

- 2 -

**Foreword**

The text of document 76/342/FDIS, future edition 2 of IEC 60825-4, 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 EN 60825-4 on 2006-10-01.

This European Standard supersedes EN 60825-4:1997 + A1:2002 + A2:2003.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2007-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-10-01

Annex ZA has been added by CENELEC.

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**Endorsement notice**

The text of the International Standard IEC 60825-4:2006 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 standards indicated:

- |              |  |
|--------------|--|
| IEC 60204-1  | NOTE Harmonized as EN 60204-1:2006 (modified).         |
| IEC 61310-3  | NOTE Harmonized as EN 61310-3:1999 (not modified).     |
| IEC 61496-2  | NOTE Harmonized as CLC/TS 61496-2:2006 (not modified). |
| IEC/TS 62046 | NOTE Harmonized as CLC/TS 62046:2005 (not modified).   |
| ISO 10218    | NOTE Harmonized as EN 775:1992 (modified).             |

## Annex ZA (normative)

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

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60825-1	1993	Safety of laser products Part 1: Equipment classification, requirements and user's guide	EN 60825-1 + corr. February	1994 1995
A1	1997		A1	2002
A2	2001		A2 + corr. April	2001 2004
ISO 11553-1	2005	Safety of machinery - Laser processing machines Part 1: General safety requirements	EN ISO 11553-1	2005
ISO 12100-1	2003	Safety of machinery - Basic concepts, general principles for design Part 1: Basic terminology, methodology	EN ISO 12100-1	2003
ISO 12100-2	2003	Safety of machinery - Basic concepts, general principles for design Part 2: Technical principles	EN ISO 12100-2	2003

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**SAFETY OF LASER PRODUCTS –**

**Part 4: Laser guards**

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 60825-4 has been prepared by IEC technical committee 76: Optical radiation safety and laser equipment.

This consolidated version of IEC 60825-4 consists of the second edition (2006) [documents 76/342/FDIS and 76/351/RVD] and its amendment 1 (2008) [documents 76/383/FDIS and 76/385/RVD].

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 2.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

**I.S. EN 60825-4:2006**

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– 5 –

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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



## INTRODUCTION

At low levels of irradiance or radiant exposure, the selection of material and thickness for shielding against laser radiation is determined primarily by a need to provide sufficient optical attenuation. However, at higher levels, an additional consideration is the ability of the laser radiation to remove guard material – typically by melting, oxidation or ablation; processes that could lead to laser radiation penetrating a normally opaque material.

IEC 60825-1 deals with basic issues concerning laser guards, including human access, interlocking and labelling, and gives general guidance on the design of protective housings and enclosures for high-power lasers.

This part of IEC 60825 deals with protection against laser radiation only. Hazards from secondary radiation that may arise during material processing are not addressed.

Laser guards may also comply with standards for laser protective eyewear, but such compliance is not necessarily sufficient to satisfy the requirements of this standard.

Where the term “irradiance” is used, the expression “irradiance or radiant exposure, as appropriate” is implied.

## SAFETY OF LASER PRODUCTS –

### Part 4: Laser guards

#### 1 Scope

This part of IEC 60825 specifies the requirements for laser guards, permanent and temporary (for example for service), that enclose the process zone of a laser processing machine, and specifications for proprietary laser guards.

This standard applies to all component parts of a guard including clear (visibly transmitting) screens and viewing windows, panels, laser curtains and walls. Requirements for beam path components, beam stops and those other parts of a protective housing of a laser product which do not enclose the process zone are contained in IEC 60825-1.

In addition this part of IEC 60825 indicates:

- a) how to assess and specify the protective properties of a laser guard; and
- b) how to select a laser guard.

#### 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 60825-1:2007, *Safety of laser products – Part 1: Equipment classification and requirements*

ISO 11553-1:2005, *Safety of machinery – Laser processing machines – Safety requirements*

ISO 12100-1:2003, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology*

ISO 12100-2:2003, *Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles and specifications*

ISO 13849-1:2006, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*

ISO 14121-1:2007, *Safety of machinery – Risk assessment – Part 1: Principles*

#### 3 Definitions

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

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