
Varnost strojev – Električno občutljiva zaščitna oprema – 2. del: Posebne zahteve za opremo, ki uporablja aktivne optoelektronske zaščitne elemente (IEC 61496-2:2006)

Safety of machinery - Electro-sensitive protective equipment – Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs) (IEC 61496-2:2006)

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English version

**Safety of machinery -
Electro-sensitive protective equipment
Part 2: Particular requirements for equipment using
active opto-electronic protective devices (AOPDs)
(IEC 61496-2:2006)**

Sécurité des machines -
Équipement de protection électrosensible
Partie 2: Exigences particulières à
un équipement utilisant des dispositifs
protecteurs optoélectroniques actifs
(AOPD)
(CEI 61496-2:2006)

Sicherheit von Maschinen -
Berührungslos wirkende
Schutzeinrichtungen
Teil 2: Besondere Anforderungen an
Einrichtungen, welche nach dem aktiven
opto-elektronischen Prinzip arbeiten
(IEC 61496-2:2006)

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This Technical Specification was approved by CENELEC on 2006-06-01.

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

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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

Foreword

The text of document 44/500/FDIS, future edition 2 of IEC 61496-2, prepared by IEC TC 44, Safety of machinery - Electrotechnical aspects, in collaboration with the Technical Committee CENELEC TC 44X, Safety of machinery: electrotechnical aspects, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as CLC/TS 61496-2 on 2006-06-01.

This Technical Specification supersedes CLC/TS 61496-2:2003.

This Technical Specification includes the following technical changes with respect to CLC/TS 61496-2:2003:

- a) Requirements have been corrected and made easier to understand.
- b) Test procedures have been revised to make them easier to perform and to improve repeatability.
- c) Guidance is provided for the evaluation and verification of AOPDs using design techniques for which the test procedures of this part are not appropriate.

This Technical Specification is to be used in conjunction with EN 61496-1:2004.

The following date was fixed:

- latest date by which the existence of the CLC/TS has to be announced at national level (doa) 2006-12-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61496-2:2006 was approved by CENELEC as a Technical Specification without any modification.

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	- ¹⁾	Safety of laser products Part 1: Equipment classification, requirements + corr. February and user's guide	EN 60825-1 + A11	1994 ²⁾ 1995 1996
IEC/TS 62046	2004	Safety of machinery - Application of protective equipment to detect the presence of persons	CLC/TS 62046	2005
ISO 13855	2002	Safety of machinery - Positioning of protective - equipment with respect to the approach speeds of parts of the human body	-	-
-	-	High-visibility warning clothing for professional use. Test methods and requirements	EN 471	2003

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¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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**CEI
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61496-2

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Second edition
2006-04

**Sécurité des machines –
Équipement de protection électrosensible –**

**Partie 2:
Exigences particulières à un équipement
utilisant des dispositifs protecteurs
optoélectroniques actifs (AOPD)**

**Safety of machinery –
Electro-sensitive protective equipment –**

**Part 2:
Particular requirements for equipment
using active opto-electronic protective
devices (AOPDs)**

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International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF MACHINERY –
ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT –****Part 2: Particular requirements for equipment using active
opto-electronic protective devices (AOPDs)**

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 61496-2 has been prepared by IEC technical committee 44: Safety of machinery – Electrotechnical aspects, in collaboration with CENELEC technical committee 44X: Safety of machinery – Electrotechnical aspects.

This second edition cancels and replaces the first edition published in 1997 and constitutes a technical revision.

This edition includes the following technical changes with respect to the previous edition:

- a) Requirements have been corrected and made easier to understand.
- b) Test procedures have been revised to make them easier to perform and to improve repeatability.
- c) Guidance is provided for the evaluation and verification of AOPDs using design techniques for which the test procedures of this part are not appropriate.

This standard has the status of a product family standard and may be used as a normative reference in a dedicated product standard for the safety of machinery.

This standard is to be used in conjunction with IEC 61496-1 (2004).

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

FDIS	Report on voting
44/500/FDIS	44/508/RVD

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

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

IEC 61496 consists of the following parts, under the general title: *Safety of machinery – Electro-sensitive protective equipment*

Part 1: General requirements and tests

Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)

Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Reflection (AOPDDR)

The committee has decided that the contents of this publication 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.

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INTRODUCTION

Electro-sensitive protective equipment (ESPE) is applied to machinery that presents a risk of personal injury. It provides protection by causing the machine to revert to a safe condition before a person can be placed in a hazardous situation.

This part of IEC 61496 provides particular requirements for the design, construction and testing of electro-sensitive protective equipment (ESPE) for the safeguarding of machinery, employing active opto-electronic protective devices (AOPDs) for the sensing function.

This part supplements or modifies the corresponding clauses in IEC 61496-1.

Where a particular clause or subclause of Part 1 is not mentioned in this Part 2, that clause or subclause applies as far as is reasonable. Where this part states "addition", "modification" or "replacement", the relevant text of Part 1 is to be adapted accordingly.

Each type of machine presents its own particular hazards, and it is not the purpose of this standard to recommend the manner of application of the ESPE to any particular machine. The application of the ESPE should be a matter for agreement between the equipment supplier, the machine user and the enforcing authority; in this context, attention is drawn to the relevant guidance established internationally, for example, ISO 12100.

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SAFETY OF MACHINERY – ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT –

Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)

1 Scope

This clause of Part 1 is replaced by the following:

This part of IEC 61496 specifies requirements for the design, construction and testing of electro-sensitive protective equipment (ESPE) designed specifically to detect persons as part of a safety-related system, employing active opto-electronic protective devices (AOPDs) for the sensing function. Special attention is directed to features which ensure that an appropriate safety-related performance is achieved. An ESPE may include optional safety-related functions, the requirements for which are given in Annex A of IEC 61946-1 and of this part.

This part does not specify the dimensions or configurations of the detection zone and its disposition in relation to hazardous parts for any particular application, nor what constitutes a hazardous state of any machine. It is restricted to the functioning of the ESPE and how it interfaces with the machine.

Excluded from this part are AOPDs employing radiation at wavelengths outside the range 400 nm to 1500 nm.

This part may be relevant to applications other than those for the protection of persons, for example, the protection of machinery or products from mechanical damage. In those applications, additional requirements may be necessary, for example, when the materials that are to be recognized by the sensing function have different properties from those of persons.

This part does not deal with EMC emission requirements.

2 Normative references

This clause of Part 1 is applicable except as follows:

Additional references:

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

IEC 62046:2004, *Safety of machinery – Application of protective equipment to detect the presence of persons*

ISO 13855:2002, *Safety of machinery – Positioning of protective equipment with respect to the approach speeds of parts of the human body*

EN 471:2003, *High-visibility warning clothing for professional use – Test methods and requirements.*

3 Terms and definitions

NOTE At the end of this standard there is an index which lists, in alphabetical order, the terms and acronyms defined in Clause 3 and indicates where they are used in the text.

This clause of Part 1 is applicable except as follows:

Additional definitions:

3.201

active opto-electronic protective device (AOPD)

device whose sensing function is performed by opto-electronic emitting and receiving elements detecting the interruption of optical radiations generated, within the device, by an opaque object present in the specified detection zone (or for a light beam device, on the axis of the light beam)

3.202

beam centre-line

optical path joining the optical centre of an emitting element to the optical centre of the corresponding receiving element that is intended to respond to light from that emitting element during normal operation

NOTE 1 The optical axis of a light beam is not always on the beam centre-line.

NOTE 2 Physical displacement of the beam centre-line may occur as a consequence of normal operation (for example, by the use of a motor-driven mirror).

NOTE 3 For an AOPD that operates on a retro-reflective technique, the optical path is defined by the retro-reflector target together with the emitting and receiving elements.

3.203

effective aperture angle (EAA)

maximum angle of deviation from the optical alignment of the emitting element(s) and the receiving element(s) within which the AOPD continues in normal operation

3.204

light beam device

single light beam device or a multiple light beam device

- **single light beam device:** AOPD comprising one emitting element and one receiving element, where a detection zone is not specified by the supplier;
- **multiple light beam device:** AOPD comprising multiple emitting elements and corresponding receiving elements, and where a detection zone is not specified by the supplier

3.205

light curtain

AOPD comprising an integrated assembly of one or more emitting element(s) and one or more receiving element(s) forming a detection zone with a detection capability specified by the supplier

NOTE A light curtain with a large detection capability is sometimes referred to as a light grid.

3.206

test piece

opaque cylindrical element used to verify the detection capability of the AOPD

3.207

monitored blanking

configuration of the detection capability and/or detection zone in such a way that the presence of an object(s) within a defined part of the detection zone will not cause an OFF-state of the OSSD(s) but the absence (or, in some cases, a change in size or location) of the object will cause the OSSD(s) to go to the OFF-state

Replacement:

3.3

detection capability

dimension representing the diameter of the test piece which:

- for a light curtain, will actuate the sensing device when placed in the detection zone;
- for a single light beam device, will actuate the sensing device when placed in the beam centre-line;
- for a multiple light beam device, will actuate the sensing device when placed in any beam centre-line

NOTE Can also be used to mean the ability to detect a test piece of the specified diameter.

4 Functional, design and environmental requirements

This clause of Part 1 is applicable except as follows:

4.1 Functional requirements

4.1.2 Sensing function

Replacement:

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4.1.2.1 General

The sensing function shall be effective over the detection zone specified by the supplier. No adjustment of the detection zone, detection capability or blanking function shall be possible without the use of a key, key-word or tool.

The sensing device of a light curtain shall be actuated and the OSSD(s) shall go to the OFF-state when a test piece in accordance with 4.2.13 is placed anywhere within the detection zone either static (at any angle) or moving (with the axis of the cylinder normal to the plane of the detection zone), at any speed between 0 m/s and 1,6 m/s.

The sensing device of a light beam device shall be actuated and the OSSD(s) shall go to the OFF-state when a test piece in accordance with 4.2.13 is present in the beam centre-line, at any point throughout the operating distance, with the axis of the cylinder normal to the axis of the beam.

NOTE The purpose of this requirement is to ensure that the OSSD(s) go to the OFF-state when a person or part of a person passes through the detection zone or light beam. Based on a dimension of 150 mm and a walking speed of 1,6 m/s, a minimum OFF time of 80 ms was determined to be adequate.

When the OSSD(s) go to the OFF-state, they shall remain in the OFF-state while the test piece is present in the detection zone (or light beam) or for at least 80 ms, whichever is greater.

Where the supplier states that an AOPD can be used to detect objects moving at speeds greater than those specified above, the above requirements shall be met at any speed up to and including the stated maximum speed(s).