



SLOVENSKI STANDARD
SIST EN 61496-1:2001

01-september-2001

Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests

Safety of machinery - Electro-sensitive protective equipment -- Part 1: General requirements and tests

Sicherheit von Maschinen - Berührungslos wirkende Schutzeinrichtungen -- Teil 1: Allgemeine Anforderungen und Prüfungen

Sécurité des machines - Equipements de protection électro-sensibles -- Partie 1: Prescriptions générales et essais

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EUROPEAN STANDARD
 NORME EUROPÉENNE
 EUROPÄISCHE NORM

EN 61496-1

December 1997

ICS 13.110

Descriptors: Electrical equipment, machines, control and operation requirements, testing, definitions, electrical safety requirements, electro-sensitive protective equipment

English version

**Safety of machinery - Electro-sensitive protective equipment
 Part 1: General requirements and tests
 (IEC 61496-1:1997)**

Sécurité des machines - Equipements
 de protection électro-sensibles
 Partie 1: Prescriptions générales et
 essais
 (CEI 61496-1:1997)

Sicherheit von Maschinen
 Berührungslos wirkende
 Schutzeinrichtungen
 Teil 1: Allgemeine Anforderungen
 und Prüfungen
 (IEC 61496-1:1997)

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This European Standard was approved by CENELEC on 1997-10-01. 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, 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

Foreword

The text of documents 44/206/FDIS and 44/206A/FDIS, future edition 1 of IEC 61496-1, prepared by IEC TC 44, Safety of machinery: Electrotechnical aspects, in collaboration with CENELEC TC 44X, Safety of machinery: Electrotechnical aspects, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61496-1 on 1997-10-01.

This standard has been prepared as a specification of general requirements for electro-sensitive protective equipment (ESPE) specifically related to machinery safety and has been developed to meet the needs of the equipment suppliers, the machine users and safety enforcement authorities.

This standard has been prepared under a mandate given to CEN/CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of the following EC Directives:

- Electromagnetic compatibility (89/336/EEC);
- Machinery Directive (89/392/EEC).

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) 1998-07-01
- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 1998-07-01

NOTE: Within CENELEC the subject of this standard was originally submitted to the enquiry procedure with reference prEN 50100-1. Any reference made to prEN 50100-1 in whatever document should henceforth be understood as referring to this EN 61496-1.

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A, B and ZA are normative and annex C is informative.
Annex ZA has been added by CENELEC.

This standard has the status of a product family standard (type B2 in CEN) and may be used as a normative reference in the preparation of product family standards or dedicated product standards (type C in CEN as defined in EN 414:1992, 3.1) for machines.

Endorsement notice

The text of the International Standard IEC 61496-1:1997 was approved by CENELEC as a European Standard without any modification.

In the official version, for annex C, Bibliography, the following notes have to be added for the standards indicated:

- | | |
|------------|---|
| IEC 60812 | NOTE: Harmonized as HD 485 S1:1987 (not modified). |
| IEC 61025 | NOTE: Harmonized as HD 617 S1:1992 (not modified). |
| ISO 9000-3 | NOTE: Harmonized as EN 29000-3:1993 (not modified). |
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Annex ZA (normative)

Normative references to international publications
with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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 60050(191)	1990	International Electrotechnical Vocabulary (IEV) Chapter 191: Dependability and quality of service	-	-
IEC 60068-2-6	1995	Environmental testing Part 2: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6 ¹⁾	1995
IEC 60068-2-29	1987	Test Eb and guidance: Bump	EN 60068-2-29 ²⁾	1993
IEC 60204-1	1997	Safety of machinery - Electrical equipment of machines Part 1: General requirements	EN 60204-1	1997
IEC 60249-2	series	Base materials for printed circuits Part 2: Specifications	EN 60249-2	series
IEC 60439-1	1992	Low-voltage switchgear and controlgear assemblies Part 1: Type-tested and partially type-tested assemblies	EN 60439-1 ³⁾ + corr. August 1994 + corr. December 1997 + A11 1996 + corr. December 1997	1994 1994 1997 1996 1997
IEC 60445	1988	Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system	EN 60445	1990
IEC 60447	1993	Man-machine interface (MMI) - Actuating principles	EN 60447	1993
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May 1993	1991 1993

1) EN 60068-2-6 includes corrigendum March 1995 to IEC 60068-2-6.

2) EN 60068-2-29 includes the corrigendum to IEC 60068-2-29.

3) EN 60439-1 includes corrigendum December 1993 to IEC 60439-1.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60664-1 (mod)	1992	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests	HD 625.1 S1 + corr. November 1996	1996
IEC 60742 (mod)	1983	Isolating transformers and safety isolating transformers - Requirements	EN 60742 ⁴⁾	1995
IEC 60947-5-1	1990	Low-voltage switchgear and controlgear Part 5: Control circuit devices and switching elements Section 1: Electromechanical control circuit devices	EN 60947-5-1 ⁵⁾	1991
IEC 61000-4-2	1995	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques -- Section 2: Electrostatic discharge immunity test	EN 61000-4-2	1995
IEC 61000-4-3 (mod)	1995	Section 3: Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	1996
IEC 61000-4-4	1995	Section 4: Electrical fast transient/burst immunity test	EN 61000-4-4	1995
IEC 61000-4-5	1995	Section 5: Surge immunity test	EN 61000-4-5	1995
IEC 61000-4-6	1996	Section 6: Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	1996
IEC 61310-1	1995	Safety of machinery - Indication, marking and actuation Part 1: Requirements for visual, auditory and tactile signals	EN 61310-1	1995
ISO 9001	1994	Quality systems - Model for quality assurance in design development, production, installation and servicing	EN ISO 9001	1994
ISO/TR 12100-1	1992	Safety of machinery - Basic concepts, general principles for design Part 1: Basic terminology, methodology	-	-
ISO/TR 12100-2	1992	Part 2: Technical principles and specifications	-	-

4) EN 60742 includes A1:1992 to IEC 60742.

5) EN 60947-5-1 is superseded by EN 60947-5-1:1997, which is based on IEC 60947-5-1:1997.

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**CEI
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61496-1

Première édition
First edition
1997-08

**Sécurité des machines –
Equipements de protection électro-sensibles –**

**Partie 1:
Prescriptions générales et essais**

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Electro-sensitive protective equipment –**

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**Part 1:
General requirements and tests**

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF MACHINERY –
ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT –**

Part 1: General requirements and tests

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61496-1 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 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 has been prepared as a specification of general requirements for electro-sensitive protective equipment (ESPE) specifically related to machinery safety and has been developed to meet the needs of manufacturers, industrial users and safety enforcement authorities.

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

FDIS	Report on voting
44/206/FDIS	44/209/RVD

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

Annexes A and B form an integral part of this standard.

Annex C is for information only.

INTRODUCTION

An electro-sensitive protective equipment (ESPE) is applied to machinery presenting 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 general design and performance requirements of ESPEs for use over a broad range of applications. Essential features of equipment meeting the requirements of this standard are the appropriate level of safety-related performance provided and the built-in periodic functional checks/self-checks that are specified to ensure that this level of performance is maintained.

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, and in this context attention is drawn to the relevant guidance established internationally, for example ISO TR-12100.

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SAFETY OF MACHINERY – ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT –

Part 1: General requirements and tests

1 Scope

This part of IEC 61496 specifies general requirements for the design, construction and testing of electro-sensitive protective equipment (ESPE) for the safeguarding of machinery. Special attention is directed to functional and design requirements that ensure an appropriate safety-related performance is achieved. An ESPE may include optional safety-related functions, the requirements for which are given in annex A.

The particular requirements for specific types of sensing function are given in other parts of this standard.

This standard does not specify the dimensions or configuration of the detection zone and its disposition in relation to hazards in 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.

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

This standard does not deal with electromagnetic compatibility (EMC) emission requirements.

This part of IEC 61496 provides general requirements for ESPEs of various types employing different methods of sensing. The particular requirements for specific types of sensing function will be covered in subsequent parts of this standard. The requirements for ESPEs using active opto-electric protective devices, e.g. light curtains, are contained in part 2.

This part refers to the technical suitability of the electro-sensitive protective equipment. Its application may require the use of substances and/or test procedures that could be injurious to health unless adequate precautions were taken. Conformance with this standard in no way absolves either the supplier or the user from statutory obligations relating to the safety and health of persons during the use of the equipment covered by this standard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61496. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61496 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(191):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 191: Dependability and quality of service*

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-29:1987, *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump*

IEC 60204-1, — *Safety of machinery – Electrical equipment of machines – Part 1: General requirements¹⁾*

IEC 60249-2, *Base materials for printed circuits – Part 2: Specifications*

IEC 60439-1:1992, *Low-voltage switchgear and controlgear assemblies – Part 1: Type-tested and partially type-tested assemblies*

IEC 60445:1988, *Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system*

IEC 60447:1993, *Man-machine interface (MMI) – Actuating principles*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60742:1983, *Isolating transformers and safety isolating transformers – Requirements*

IEC 60947-5-1:1990, *Low-voltage switchgear and controlgear – Part 5: Control circuit devices and switching elements – Section One: Electromechanical control circuit devices*

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test – Basic EMC publication*

IEC 61000-4-3:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic field immunity test – Basic EMC publication*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test – Basic EMC publication*

IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity tests*

IEC 61000-4-6:1996, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances, induced by radio-frequency fields – Basic EMC publication*

IEC 61310-1:1995, *Safety of machinery – Indication, marketing and actuation – Part 1: Requirements for visual, auditory and tactile signals*

¹⁾ To be published.

ISO 9001:1994, *Quality systems – Model for quality assurance in design, development, production, installation and servicing*

ISO/TR 12100-1:1992, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology*

ISO/TR 12100-2:1992, *Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles and specifications*

3 Definitions

NOTE – The index lists, in alphabetical order, the terms and acronyms defined in this clause and indicates where they are used in the text of this part.

For the purpose of this part of IEC 61496, the following definitions apply.

3.1 electro-sensitive protective equipment (ESPE): An assembly of devices and/or components working together for protective tripping or presence-sensing purposes and comprising as a minimum:

- a sensing device;
- controlling/monitoring devices;
- output signal switching devices.

NOTE – The safety-related control system associated with the ESPE, or the ESPE itself, may further include a secondary switching device, muting functions, stopping performance monitor, etc. (see annex A). In order to assist in the understanding of the inter-relationship of the various major elements of the ESPE and the associated safety-related control systems, block schematic diagrams are included as figures A.1 and A.2.

3.2 controlling/monitoring device: The part of the electro-sensitive protective equipment (ESPE) that:

- receives and processes information from the sensing device and provides signals to the output signal switching devices (OSSDs);
- monitors the sensing device and the OSSDs.

3.3 defined signal range: The permissible signal range within which the safety-related signal threshold values have been set and are detected by the sensing device.

3.4 detection capability: The sensing function parameter limit specified by the supplier that will cause actuation of the electro-sensitive protective equipment (ESPE).

3.5 detection zone: The zone within which a specified test piece will be detected by the electro-sensitive protective equipment (ESPE).

3.6 external device monitoring (EDM): A means by which the electro-sensitive protective equipment (ESPE) monitors the state of control devices which are external to the ESPE.

3.7 failure: The termination of the ability of an item to perform a required function.
[IEV 191-04-01]

NOTES

- 1 After failure the item has a fault.
- 2 "Failure" is an event, as distinguished from "fault", which is a state.
- 3 This concept as defined does not apply to items consisting of software only.
- 4 In practice the terms fault and failure are often used synonymously.