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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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

IEC 61496-1:2012

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF MACHINERY – ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT –

Part 1: General requirements and tests

FOREWORD

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International Standard IEC 61496-1 has been prepared by IEC technical committee 44: Safety of machinery – Electrotechnical aspects.

This third edition cancels and replaces the second edition published in 2004 and its amendment 1 (2007). The document 44/615/CDV, circulated to the National Committees as amendment 2, led to the publication of this new edition.

The main changes with respect to the previous edition are as follows: The design, test and verification requirements have been updated to make them consistent with the latest standards for functional safety and EMC.

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

CDV	Report on voting
44/615/CDV	44/641/RVC

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 2.

A list of all the parts in the IEC 61496 series, published under the general title *Safety of machinery – Electro-sensitive protective equipment*, can be found on the IEC website.

A vertical line in the margin shows where the base publication has been modified by amendment 2.

The committee has decided that the contents of this publication will remain unchanged until the stability 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- withdrawn,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

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 12100.

This part of IEC 61496 specifies technical requirements of electro-sensitive protective equipment. The application of this standard may require the use of substances and/or test procedures that could be injurious to health unless adequate precautions are 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.

Due to the complexity of the technology used to implement ESPEs, there are many issues that are highly dependent on analysis and expertise in specific test and measurement techniques. In order to provide a high level of confidence, independent review by relevant experts is recommended.

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 non-contact electro-sensitive protective equipment (ESPE) designed specifically to detect persons as part of a safety related system. 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.

While a data interface can be used to control optional safety-related ESPE functions (Annex A), this standard does not provide specific requirements. Requirements for these safety-related functions can be determined by consulting other standards (for example, IEC 61508, IEC/TS 62046, IEC 62061, and ISO13849-1).

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, different requirements can 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.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60204-1:2009, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC 60447, *Basic and safety principles for man-machine interface, marking and identification – Actuating principles*

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

IEC 60947-1:2011, *Low-voltage switchgear and controlgear – Part 1: General rules*

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

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

IEC 61000-4-4:2004, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test*

IEC 61000-4-5:2005, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

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

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61131-2:2007, *Programmable controllers – Part 2: Equipment requirements and tests*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 62061, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*

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

ISO 9001, *Quality management systems – Requirements*

ISO 12100:2010, *Safety of machinery – General principles for design – Risk assessment and risk reduction*

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

ISO 13849-2:2003, *Safety of machinery – Safety-related parts of control systems – Part 2: Validation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE The index lists, in alphabetical order, the terms and acronyms defined in Clause 3 and indicates where they are used in the text of this part.

3.1
blanking
optional function that permits an object of a size greater than the detection capability of the ESPE to be located within the detection zone without causing an OFF-state of the OSSD(s)

Note 1 to entry: Fixed blanking is a technique wherein the locations of the blanked areas of the detection zone do not change during operation. The detection capability of the other parts of the detection zone remains unchanged.

Note 2 to entry: Floating blanking is a technique wherein the blanked area of the detection zone follows the location of a moving object(s) during operation. The detection capability of the other areas remains unchanged.

3.2
controlling/monitoring device
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 (OSSD),
– monitors the sensing device and the OSSD

3.3
detection capability
sensing function parameter limit specified by the supplier that will cause actuation of the electro-sensitive protective equipment (ESPE)

3.4
detection zone
zone within which a specified test piece will be detected by the electro-sensitive protective equipment (ESPE)

3.5
electro-sensitive protective equipment
ESPE
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 and/or a safety-related data interface

Note 1 to the entry: 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).

Note 2 to entry: A safety-related communication interface can be integrated in the same enclosure as the ESPE.

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

3.7
failure
termination of the ability of an item to perform a required function

[SOURCE: IEC 60050-191:1990, 191-04-01, modified]

Note 1 to entry: After failure the item has a fault.

Note 2 to entry: 'Failure' is an event, as distinguished from 'fault', which is a state.

Note 3 to entry: This concept, as defined, does not apply to items consisting of software only.

Note 4 to entry: In practice, the terms fault and failure are often used synonymously.

3.8
failure to danger
failure which prevents or delays all output signal switching devices going to, and/or remaining in the OFF-state in response to a condition which, in normal operation, would result in their so doing