

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Safety of machinery – Application of protective equipment to detect the presence of persons**

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**Sécurité des machines – Application des équipements de protection à la détection de la présence de personnes**

IEC 62046:2018  
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**SAFETY OF MACHINERY – APPLICATION OF PROTECTIVE  
EQUIPMENT TO DETECT THE PRESENCE OF PERSONS**

## FOREWORD

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This bilingual version (2018-11) corresponds to the monolingual English version, published in 2018-03.

This first edition cancels and replaces IEC TS 62046, published in 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC TS 62046:2008:

- a) additional annexes relating to muting and vision systems,
- b) muting requirements have been updated,
- c) blanking requirements have been updated,
- d) addition of IEC 61496 series Types and capping the Safety Integrity level according to IEC 62061 and performance levels according to ISO 13849-1,



e) alignment to changes in IEC 61496 series.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
44/803/FDIS	44/812/RVD

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

The French version of this document has not been voted upon.

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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## INTRODUCTION

This International Standard provides requirements and information on the application of protective equipment, which employs (a) sensing device(s) to detect person(s), in order to reduce or minimize a risk from hazardous parts of machinery, without providing a physical barrier.

The objective of this document is to assist standards writing committees responsible for developing machine standards ("C" Standards), machine designers, manufacturers and refurbishers, machine safety certification organizations, workplace authorities and others on the proper application of protective equipment to machinery.

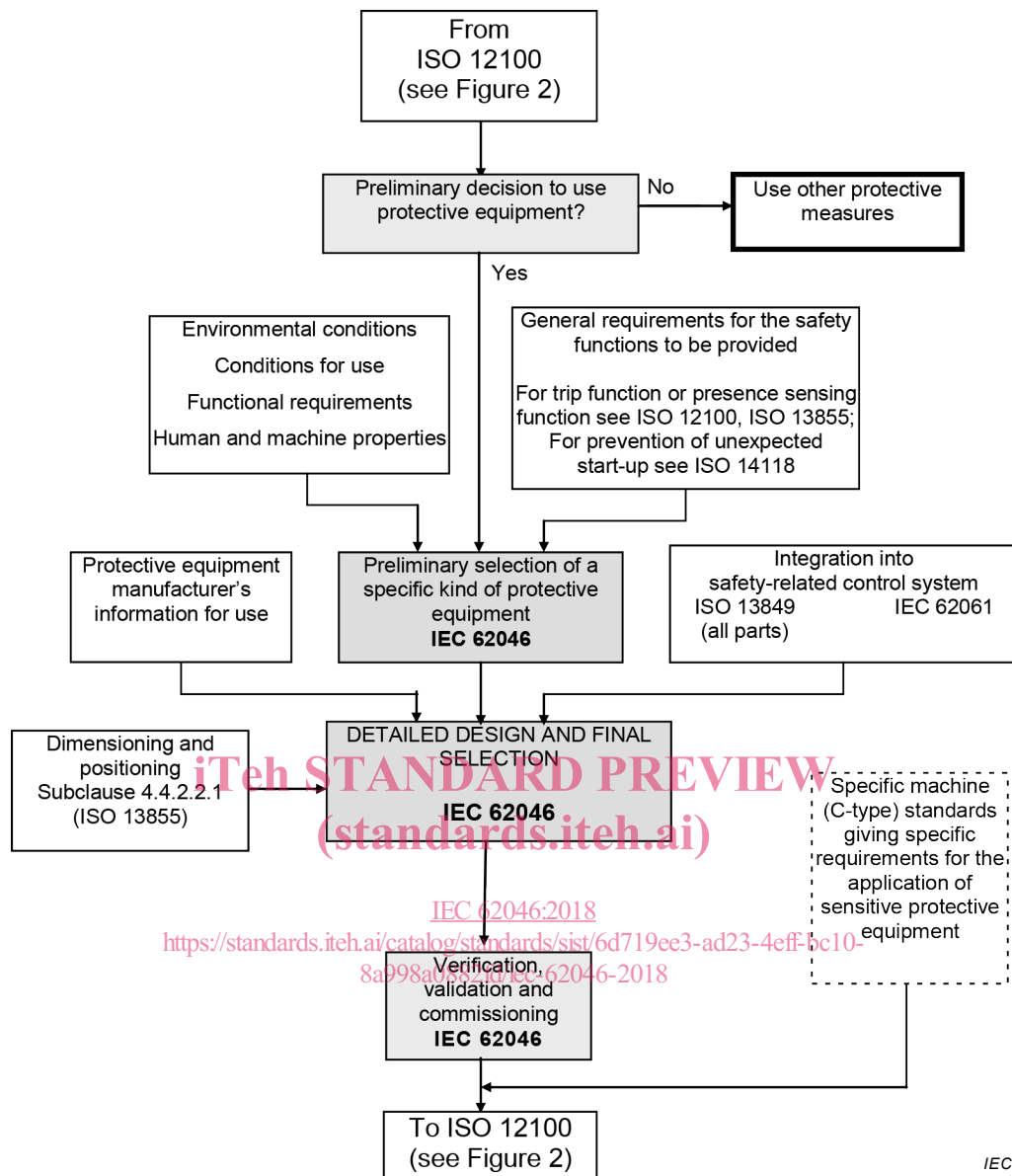
Figure 1 and Figure 2 show the general context and the intended use of this standard.

Clauses 1 to 5, 7 and 8 of this document apply to all protective equipment included in the scope, Clause 6 contains guidance for the application of specific kinds of protective equipment.

The principles of this document can be useful in the application of devices using other detection technologies but this document does not give specific requirements for devices other than those listed above.

This document considers devices standardised in the IEC 61496 series and the ISO 13856 series. Unless a product-specific safety-related standard for devices using other sensing technologies is published, their suitability as the sole means of protection from machine hazards is unknown. Great care should be taken in the selection and use of devices for which there is no product-specific safety-related standard because their behaviour, particularly under fault conditions, is not known to be sufficiently predictable.

An SILCL (SIL claim limit, see IEC 62061) or PL (Performance Level, see ISO 13849-1) or SIL (Safety Integrity Level, see IEC 61508) is not sufficient as an indication of a device's suitability for use as a safeguard. Suitability depends on appropriate sensing means, environmental conditions especially those that can affect the detection capability, behaviour under fault conditions, etc



**Figure 1 – Relationship of this International Standard to other standards**

(see also Figure 2)

# SAFETY OF MACHINERY – APPLICATION OF PROTECTIVE EQUIPMENT TO DETECT THE PRESENCE OF PERSONS

## 1 Scope

This International Standard specifies requirements for the selection, positioning, configuration and commissioning of protective equipment to detect the momentary or continued presence of persons in order to protect those persons from dangerous part(s) of machinery in industrial applications. This standard covers the application of electro-sensitive protective equipment (ESPE) specified in IEC 61496 (all parts) and pressure sensitive mats and floors specified in ISO 13856-1.

It takes into account the characteristics of the machinery, the protective equipment, the environment and human interaction by persons of 14 years and older.

This document includes informative annexes to provide guidance on the application of protective equipment to detect the presence of persons. These annexes contain examples to illustrate the principles of this standard. These examples are not intended to be the only solutions to a given application and are not intended to restrict innovation or advancement of technology. The examples are provided only as representative solutions to illustrate some of the concepts of integration of protective equipment, and have been simplified for clarity, so they may be incomplete.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 62061, *Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems*

ISO 12100:2010<sup>1</sup>, *Safety of machinery – General principles for design – Risk assessment and risk reduction*

ISO 13849 (all parts), *Safety of machinery – Safety-related parts of control systems*

ISO 13855:2010, *Safety of machinery – Positioning of safeguards with respect to the approach speeds of parts of the human body*

## 3 Terms, definitions and abbreviated terms

### 3.1 Terms and definitions

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

---

<sup>1</sup> ISO 12100:2010 constitutes a consolidation without technical changes of ISO 12100-1:2003, ISO 12100-2:2003, ISO 14121-1:2007 and related amendments. This consolidation does not require updates or revisions to type B- and type C- standards or other documents (e.g. for risk assessment) based on the previous standards.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1.1

#### **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)

[SOURCE: IEC 61496-2:2013, 3.201]

### 3.1.2

#### **actuation of an ESPE**

detection of an object causing the OSSD(s) to go to the OFF-state

### 3.1.3

#### **active opto-electronic protective device responsive to diffuse reflection**

##### **AOPDDR**

device, whose sensing function is performed by opto-electronic emitting and receiving elements, that detects the diffuse reflection of optical radiations generated within the device by an object present in a detection zone specified in two dimensions

[SOURCE: IEC 61496-3:2008, 3.301]

### 3.1.4

#### **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: Blanked beams are monitored for continued interruption of light..

[SOURCE: IEC 61496-1:2012, 3.1, modified – Note 1 to entry has been modified, Note 2 to entry has been removed]

### 3.1.5

#### **detection capability**

sensing function parameter limit specified by the supplier that will cause actuation of the protective equipment

[SOURCE: IEC 61496-1:2012, 3.3, modified – "electro-sensitive" has been removed before "protective equipment"]

### 3.1.6

#### **detection zone**

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

Note 1 to entry: ISO 13856-1 uses the term "effective sensing area" when describing pressure-sensitive mats and floors. In this document the terms "detection zone" and "effective sensing area" are used synonymously.

[SOURCE: IEC 61496-1:2012, 3.4, modified – Note 1 to entry has been added]

**3.1.7**  
**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

[SOURCE: IEC 61496-1:2012, 3.5, modified – (Notes 1 and 2 to entry have been removed)]

**3.1.8**  
**effective sensing area**, <of a pressure-sensitive mat or floor>

part of the top surface area of the sensor or a combination of sensors of the pressure-sensitive mat or pressure-sensitive floor within which a response to an actuating force will take place

Note 1 to entry: IEC 61496-1 uses the term “detection zone” when describing electro-sensitive protective equipment. In this document the terms “detection zone” and “effective sensing area” are used synonymously.

[SOURCE: ISO 13856-1:2013, 3.4, modified – Note 1 to entry has been modified]

**3.1.9**  
**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

[SOURCE: IEC 61496-1:2012, 3.6]  
<https://standards.itec.ai/catalog/standards/sist/6d719ee3-ad23-4eff-bc10-8a998a0882fd/iec-62046-2018>

**3.1.10**  
**failure**, <of equipment>  
termination of the ability of an item to perform a required function

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.

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

**3.1.11**  
**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

[SOURCE: IEC 61496-1:2012, 3.8]

**3.1.12**  
**fault**

state of an item characterized by its inability to perform a required function, excluding the inability during preventive maintenance or other planned actions, or due to lack of external resources

Note 1 to entry: A fault is often the result of a failure of the item itself, but may exist without prior failure.

Note 2 to entry: In the field of machinery, the English term 'fault' is commonly used in accordance with the definition in IEC 191-05-01, whereas the French term "défaut" and the German term "fehler" are used rather than the term "panne" and "fehlzustand" that appear with this definition.

Note 3 to entry: In practice, the terms "fault" and "failure" (see 3.1.9) are often used synonymously.

[SOURCE: IEC 60050-191:1990, 191-05-01, modified – Notes 1, 2 and 3 to entry have been added ]

### 3.1.13

#### **final switching device**

#### **FSD**

component of the machine's safety-related control system that interrupts the circuit to the machine primary control element (MPCE) when the output signal switching device (OSSD) goes to the OFF-state

[SOURCE: IEC 61496-1:2012, 3.10]

### 3.1.14

#### **hazard**

potential source of harm

Note 1 to entry: The word "hazard" is generally used in conjunction with other words defining its origin or the nature of the expected injury or damage to health: electrical shock hazard, crushing hazard, shearing hazard, toxic hazard, etc.

[SOURCE: ISO 12100:2010, 3.6, modified – Note 1 to entry has been modified, Notes 2 and 3 to entry have been removed]

### 3.1.15

#### **hazardous situation**

circumstance in which a person is exposed to at least one hazard

Note 1 to entry: The exposure can result in harm immediately or over a period of time.

[SOURCE: ISO 12100:2010, 3.10]

### 3.1.16

#### **hazard zone**

#### **danger zone**

any space within and/or around machinery in which a person can be exposed to a hazard

Note 1 to entry: The hazard:

- either is permanently present during the intended use of the machine (motion of hazardous moving elements, electric arc during a welding phase); or
- can appear unexpectedly (unintended/unexpected start-up).

[SOURCE: ISO 12100, 3.11, modified – Note 1 to entry has been added]

### 3.1.17

#### **integrator**

individual or group of individuals responsible for selecting, configuring, installing and/or interfacing the protective equipment to achieve the safeguarding identified by the risk assessment

### 3.1.18

#### **light beam device**

AOPD comprising one or more emitting element(s) and corresponding receiving element(s), where a detection zone is not specified by the supplier