

TECHNICAL SPECIFICATION

IEC TS 62046

First edition
2004-05

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

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

<https://standards.iteh.ai/standards/iec/23ba2b5f-bbc8-43e4-8e60-187244cbeeb3/iec-ts-62046-2004>



Reference number
IEC/TS 62046:2004(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** (www.iec.ch)

- **Catalogue of IEC publications**

The on-line catalogue on the IEC web site (http://www.iec.ch/searchpub/cur_fut.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

This summary of recently issued publications (http://www.iec.ch/online_news/justpub/jp_entry.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

Email: custserv@iec.ch
Tel: +41 22 919 02 11
Fax: +41 22 919 03 00

TECHNICAL SPECIFICATION

IEC TS 62046

First edition
2004-05

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

iTeh Standards
(<https://standards.itih.ai>)
Document Preview

<https://standards.itih.ai/standards/iec/2/ba2b5f-bbc8-43e4-8e60-187244cbeeb3/iec-ts-62046-2004>

© IEC 2004 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

XA

For price, see current catalogue

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and abbreviations	9
3.1 Terms and definitions	9
3.2 Abbreviations	15
4 Selection	16
4.1 Procedure (relationship with ISO 12100 (all parts)).....	16
4.2 Machine characteristics	18
4.2.1 Suitability of protective equipment	18
4.2.2 Suitability of protective equipment as a trip device	18
4.3 Environmental characteristics.....	18
4.4 Uses of protective equipment	20
4.5 Human characteristics	22
4.6 Protective equipment characteristics	23
4.7 Machine control system functions associated with the application of protective equipment	24
5 General application requirements	26
5.1 Positioning and configuration of the protective equipment detection zone.....	26
5.2 Integration with the safety-related control system	26
5.3 Performance of protective equipment	26
5.4 Stopping performance monitoring	28
5.5 Muting	28
5.6 Reinitiation of cyclic operation by the protective equipment	30
5.7 Start interlock.....	31
5.8 Restart interlock	31
5.9 Blanking	31
6 Particular application requirements for specific protective equipment	31
6.1 AOPDs.....	32
6.2 AOPDDRs	34
6.3 PIPDs.....	35
6.4 Pressure-sensitive mats and floors.....	35
7 Commissioning	37
8 Information for safe use.....	38
Annex A (informative) Examples of interfacing ESPEs to a machine	39
Annex B (informative) Environmental parameters of protective equipment product standards.....	40
Annex C (informative) Application examples	44
Annex D (informative) Protective devices for the detection of the position of a person	50
Bibliography.....	53

Figure 1 – Relationship of this Technical Specification to other standards	7
Figure 2 – Risk reduction process (Figure 2 of ISO 12100-1)	17
Figure 3 – Example of the effect of reflective surfaces	32
Figure 4 – Example of use of blanking	34
Figure A.1 – Integration with the control system.....	39
Figure A.2 – Integration with a safety-related control system	39
Figure C.1 – Protective equipment used as a trip device (example 1)	44
Figure C.2 – Protective equipment used as a trip device (example 2)	44
Figure C.3 – Protective equipment used as combined trip and presence sensing device	45
Figure C.4 – Protective equipment used as a combined trip and presence sensing device (example 3)	45
Figure C.5 – Horizontal AOPD	46
Figure C.6 – Vertical AOPD	47
Figure C.7 – Increased separation distance	48
Figure C.8 – Additional mechanical protection	49
Figure C.9 – Use of a trip device.....	49
Table 1 – Beam heights for light beam devices	33
Table B.1 – List of environmental considerations to assist the selection of a protective equipment.....	41

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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.
- 2) The formal decisions or agreements of 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a Technical Specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62046, which is a Technical Specification, has been prepared by IEC technical committee 44: Safety of machinery – Electrotechnical aspects.

The text of this Technical Specification is based on the following documents:

Enquiry Draft	Report on voting
44/437/DTS	44/451/RVC

Full information on the voting for the approval of this Technical Specification 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.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

- transformed into an International Standard;
- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual edition of this Technical Specification may be issued at a later date.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

IEC TS 62046:2004

<https://standards.iteh.ai/catalog/standards/iec/23ba2b5f-bbc8-43e4-8e60-187244cbebc3/iec-ts-62046-2004>

WITHDRAWN

INTRODUCTION

This Technical Specification addresses the application of protective equipment, which employs a sensing device(s) to detect person(s) in or approaching an area, in order to reduce or minimize a risk from hazardous parts of machinery, without providing a physical barrier. This specification provides information on the manner in which the protective equipment should be applied to the machine to achieve the targeted level of risk reduction.

The objective of this specification 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.

Figures 1 and 2 show the general context and the intended use of this specification.

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

Withhold

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC TS 62046:2004](https://standards.iteh.ai/standards/iec/23ba2b5f-bbc8-43e4-8e60-187244cbeeb3/iec-ts-62046-2004)

<https://standards.iteh.ai/standards/iec/23ba2b5f-bbc8-43e4-8e60-187244cbeeb3/iec-ts-62046-2004>

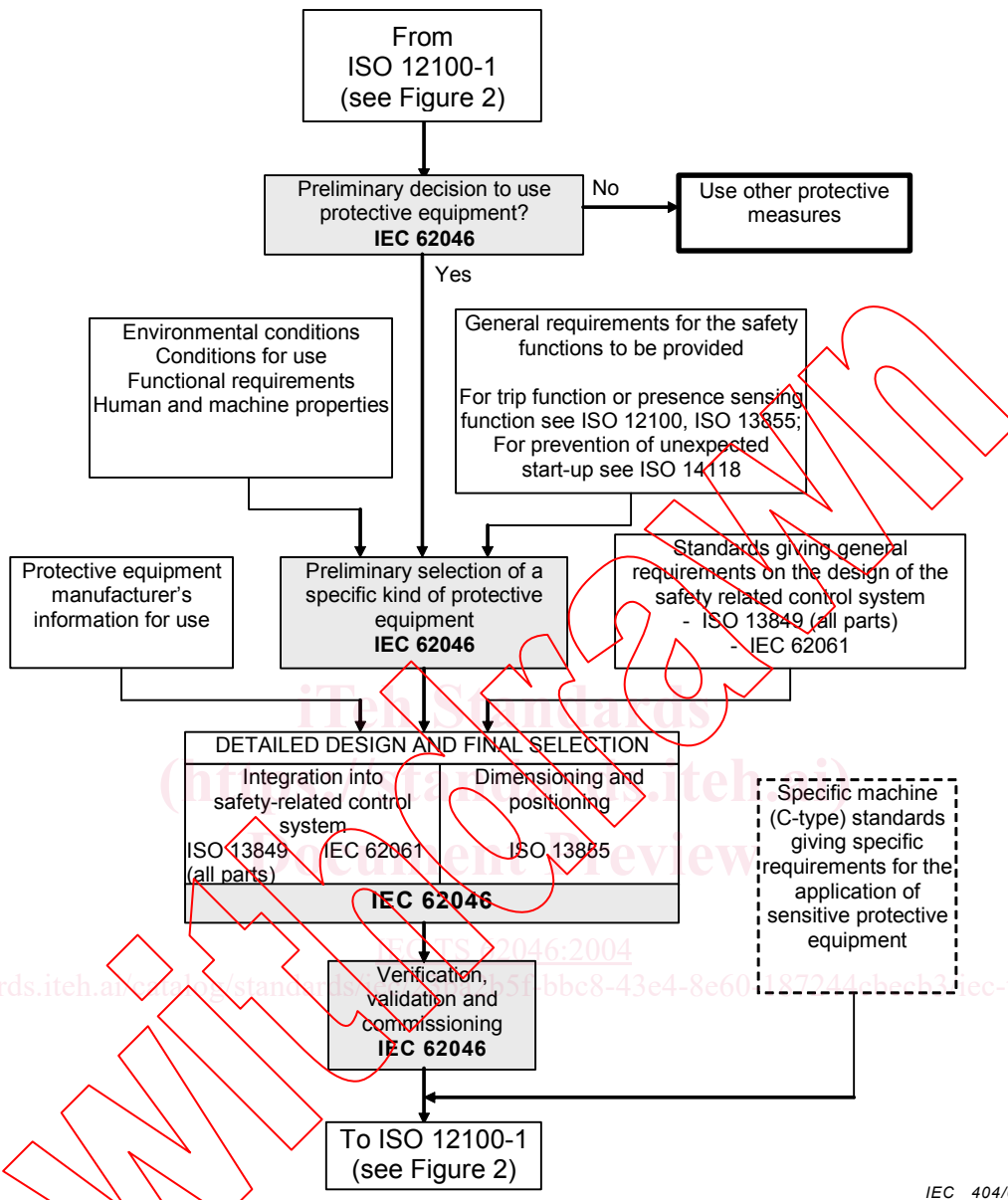


Figure 1 – Relationship of this Technical Specification to other standards

(see also Figure 2)

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

1 Scope

This Technical Specification specifies requirements for the selection, positioning, configuration and commissioning, of protective equipment to detect the presence of persons in order to protect those persons from dangerous part(s) of machinery in industrial applications. This specification 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.

NOTE This Technical Specification may also be used for guidance in the application of other protective devices.

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

IEC 61496-1:2004, *Safety of Machinery – Electro-sensitive protective equipment – General requirements and tests*

IEC 61496-2:1997, *Safety of machinery – Electro-sensitive protective equipment – Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*

IEC 61496-3:2001, *Safety of machinery – Electro-sensitive protective equipment – Particular requirements for equipment for Active Opto-Electronic Protective Devices responsive to Diffuse Reflection (AOPDDR)*

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

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*

ISO 13849-1:1999, *Safety of Machinery – Safety-related parts of control systems – Part 1: General principles for design*

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

ISO 13856-1:2001, *Safety of machinery – Pressure-sensitive protective devices – Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors*

ISO 14118:2000, *Safety of machinery – Prevention of unexpected start-up*

ISO 14121:1999, *Safety of machinery – Principles of risk assessment*

CLC/TS 50418: 2004, *Safety of Machinery - Electro-sensitive protective equipment - Passive infra-red protective devices (PIPDs)*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

blinking

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)

3.1.2

detection capability

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

NOTE Adapted from IEC 61496-1.

3.1.3

detection zone

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

NOTE 1 ISO 13856 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.

NOTE 2 Adapted from IEC 61496-1.

3.1.4

effective sensing area

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

NOTE 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.

NOTE Adapted from ISO 13856-1.

3.1.5

failure (of equipment)

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

NOTE 1 After failure the item has a fault.

NOTE 2 "Failure" is an event, as distinguished from "fault", which is a state.

NOTE 3 This concept as defined does not apply to items consisting of software only.

[IEV-191-04-01]

3.1.6

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

[IEC 61496-1, 3.8]

3.1.7

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

[IEV 191-05-01]

NOTE 1 A fault is often the result of a failure of the item itself, but may exist without prior failure.

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

NOTE 3 In practice, the terms "fault" and "failure" (see 3.1.5) are often used synonymously.

3.1.8

hazard

potential source of harm

[ISO 12100-1, 3.6]

NOTE 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.

3.1.9

hazardous situation

circumstance in which a person is exposed to at least one hazard. The exposure can immediately or over a period of time result in harm

[ISO 12100-1, 3.9]

3.1.10

hazard zone (danger zone)

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

[ISO 12100-1, 3.10]

NOTE The hazard generating the risk envisaged in this definition:

- 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).

3.1.11

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

3.1.12

lock-out condition

condition, initiated by a fault, preventing normal operation of the protective equipment which is automatically attained when all output signal switching devices (OSSDs) and, where applicable, all final switching devices (FSDs) and secondary switching devices (SSD) are signalled to go to the OFF-state

[IEC 61496-1, 3.13 modified]

3.1.13**muting**

temporary automatic suspension of a safety function(s) by safety-related parts of the control system

[IEC 61496-1, 3.16]

NOTE When muting is provided as part of the protective equipment and the protective equipment is muted, the OSSD(s) remain in the 'ON' state upon activation of the protective equipment sensing function and safety is maintained by other means.

3.1.14**overall system stopping performance**

time interval resulting from the sum of the protective equipment response time and the time to the cessation of hazardous machine operation

[IEC 61496-1, 3.20]

3.1.15**Passive Infrared Protective Device****PIPD**

device whose sensing function is performed by a receiving element(s) detecting thermal radiation emitted by an object placed in, or moving within, the specified detection zone

3.1.16**periodic test**

technique which stimulates the input of the protective equipment sensing device(s) to determine if the protective equipment OSSD(s) go to the off state when required to do so

NOTE The test input signal is usually produced by an external machine test input and is performed at intervals, determined by the risk assessment, which provide a reasonable degree of confidence that the intended risk reduction will be achieved.

3.1.17**protective equipment**

assembly of devices using non-contact (electro-sensitive) or contact (pressure sensitive) sensing means for detection of the presence of person(s) or parts of person(s) for the purpose of controlling hazards associated with machinery and comprising as a minimum:

- a sensing device;
- control and monitoring devices;
- output signal switching devices

NOTE The safety related control system associated with the protective equipment, or the protective equipment itself, can include additional safety features such as secondary switching devices, muting function, stopping performance monitoring, etc.

3.1.18**presence sensing function**

detection of the presence of a person, or a part of a person, while in a hazardous zone to enable prevention of hazardous situations such as unexpected/unintended start-up of the machine

3.1.19
protective measure
safety measure

measure intended to achieve risk reduction, implemented:

- by the designer (inherent design, safeguarding and complementary protective measures, information for use) and
- by the user (organization: safe working procedures, supervision, permit-to-work systems, additional safeguards; personal protective equipment; training)

[ISO 12100-1, 3.18]

3.1.20
reasonably foreseeable misuse

use of a machine in a way not intended by the manufacturer, but which can result from readily predictable human behaviour

[ISO/IEC Guide 51, 3.14 modified]

3.1.21
(protective equipment) response time

maximum time between the occurrence of the event leading to the actuation of the sensing device and the output signal switching device (OSSD) achieving the OFF-state

NOTE For pressure-sensitive protective devices, the event leading to the actuation of the sensing device is the application of a force within the effective sensing area

[IEC 61496-1, 3.21 modified]

3.1.22
restart interlock

means of preventing automatic restarting of a machine after actuation of the sensing device during a hazardous part of the machine operating cycle, after a change in mode of operation of the machine, and/or after a change in the means of start control of the machine

[IEC 61496-1, 3.22]

NOTE Modes of operation include inch, single stroke, automatic. Means of start control include foot switch, two-hand control, and single or double actuation of an electro-sensitive protective equipment (ESPE) sensing device.

3.1.23
risk

combination of the probability of occurrence of harm and the severity of that harm

[ISO 12100-1, 3.11]

3.1.24
risk assessment

overall process comprising a risk analysis and a risk evaluation

[ISO 12100-1, 3.13]

3.1.24.1
risk analysis

combination of the specification of the limits of the machine, hazard identification and risk estimation

[ISO 12100-1, 3.14]