

Australian Standard®

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## **Safeguarding of machinery**

### **Part 3: Manufacturing and testing requirements for electro-sensitive systems — Optoelectronic devices**

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This Australian Standard was prepared by Committee SF/41, General Principles for the Guarding of Machinery. It was approved on behalf of the Council of Standards Australia on 31 December 1997 and published on 5 April 1998.

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The following interests are represented on Committee SF/41:

Australian Chamber of Commerce & Industry  
Australian Manufacturing Workers Union  
Department for Industrial Affairs, S.A.  
Department of Training and Industrial Relations, Qld  
Electricity Supply Association of Australia  
Ergonomics Society of Australia  
Federal Chamber of Automotive Industries  
Metal Trades Industry Association of Australia  
National Safety Council of Australia  
Safety Institute of Australia  
Tractor and Machinery Association of Australia  
University of Melbourne  
Victorian WorkCover Authority  
WorkCover New South Wales  
WorkSafe Western Australia

Additional interests participating in preparation of Standard:

Optoelectronic protective equipment manufacturers

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## PREFACE

This Standard was prepared by the Standards Australia Committee SF/41, General Principles for the Guarding of Machinery, as a revision, in part, of AS 4024.2(Int) — 1992, *Safeguarding of machinery, Part 2: Presence sensing systems*.

During its work in preparing this Standard, the Committee considered the draft Standards developed within the European Community (CEN) and the International Electrotechnical Commission (IEC). These Standards, dealing with electro-sensitive systems and optoelectronic devices, have yet to be finalized and because of the need for guidance on manufacturing and testing of optoelectronic devices used in machinery guarding applications, the Committee agreed to base this Standard upon the relevant Sections of the now withdrawn AS 4024.2 (Int) — 1992. By using information from the old Standard the Committee is seeking to minimize the amount of change to Australian industry, since the next edition of this Standard is likely to be the yet to be finalized International Standard. The adoption of International Standards where possible, is a longstanding policy of Standards Australia.

The Committee is aware of the development within the International Electrotechnical Commission (IEC) of a Standard dealing with the same subject and based upon the same draft European Standard. When that Standard is published by the IEC, it will also be published by CEN as a European Standard, which will be adopted as the national Standard in the member countries of the European Community.

In the meantime, the Committee agreed that electro-sensitive protective systems using optoelectronic devices and manufactured in compliance with those IEC or CEN Standards are deemed to comply with this Australian Standard. This will serve two purposes. Firstly, it will allow the use of imported equipment without the additional cost of additional testing to ensure compliance with the Australian Standard. Secondly, it will permit local manufacturers wishing to export their product to test only to the IEC or CEN Standard, again without having to test to the Australian Standard.

The term 'normative' has been used in this Standard to define the application of the appendix to which it applies. A normative appendix is an integral part of the Standard.

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## CONTENTS

|                                                                                           | <i>Page</i> |
|-------------------------------------------------------------------------------------------|-------------|
| <b>SECTION 1 SCOPE AND GENERAL</b>                                                        |             |
| 1.1 SCOPE .....                                                                           | 4           |
| 1.2 OBJECTIVE .....                                                                       | 4           |
| 1.3 APPLICATION .....                                                                     | 4           |
| 1.4 REFERENCED DOCUMENTS .....                                                            | 4           |
| 1.5 DEFINITIONS .....                                                                     | 5           |
| 1.6 LABELLING .....                                                                       | 6           |
| 1.7 EQUIVALENT STANDARDS .....                                                            | 6           |
| <b>SECTION 2 GENERAL REQUIREMENTS</b>                                                     |             |
| 2.1 DESIGN .....                                                                          | 9           |
| 2.2 PERFORMANCE .....                                                                     | 9           |
| 2.3 SWITCHING DEVICES .....                                                               | 11          |
| 2.4 MUTING .....                                                                          | 11          |
| 2.5 FAILURE CONDITION .....                                                               | 12          |
| 2.6 PROTECTIVE EQUIPMENT CONTROL UNIT .....                                               | 13          |
| 2.7 SENSING UNITS .....                                                                   | 13          |
| <b>SECTION 3 SPECIAL REQUIREMENTS FOR PROTECTIVE EQUIPMENT</b>                            |             |
| 3.1 SPECIAL REQUIREMENTS FOR SELF-MONITORING ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT ..... | 14          |
| 3.2 SPECIAL REQUIREMENTS FOR ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT WITH TESTING .....    | 14          |
| 3.3 APERTURE ANGLE .....                                                                  | 14          |
| <b>SECTION 4 SAFETY MONITORING DEVICE FACILITIES</b>                                      |             |
| 4.1 GENERAL .....                                                                         | 16          |
| 4.2 STOPPING PERFORMANCE MONITORING .....                                                 | 16          |
| <b>SECTION 5 ENCLOSURES</b>                                                               |             |
| 5.1 GENERAL .....                                                                         | 18          |
| 5.2 CABLE ENTRY POINTS .....                                                              | 18          |
| 5.3 JOINTING COMPOUNDS .....                                                              | 18          |
| 5.4 SHARP EDGES .....                                                                     | 18          |
| 5.5 MEDIA SEGREGATION .....                                                               | 18          |
| 5.6 ACCESS .....                                                                          | 18          |
| <b>APPENDIX A TYPE TESTS FOR ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT .....</b>             |             |
|                                                                                           | <b>19</b>   |

STANDARDS AUSTRALIA

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**Australian Standard**

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**Safeguarding of machinery**

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Part 3: Manufacturing and testing requirements for electro-sensitive systems — Optoelectronic devices

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SECTION 1 SCOPE AND GENERAL

**1.1 SCOPE** This Standard specifies the manufacturing and testing requirements for optoelectronic devices used in electro-sensitive protective equipment specifically related to machinery safety.

**1.2 OBJECTIVE** The objective of this Standard is to enable designers, manufacturers, suppliers, employers and users of machinery to minimize the risks to health and safety of employees and others working with or otherwise near machinery.

**1.3 APPLICATION** This Standard is intended for use by those who design, manufacture, supply, install or use machinery guarding or safety devices. It applies to optoelectronic protective devices employing radiation of wavelength within the range 400 nm to 1500 nm.

Alternative methods of providing safety to those given may be used provided that the level of safety offered by the alternative is at least equivalent to that provided by the methods given in this Standard.

Some regulatory authorities have specific requirements relating to the forms that guarding may take and to the order in which guarding techniques may be considered. Users of this Standard should therefore make themselves aware of any specific requirements in the jurisdiction where the machinery will be used.

This Standard may still be used in these jurisdictions to identify the most appropriate level of system integrity required, and to provide guidance in other aspects of machine system safety.

**1.4 REFERENCED DOCUMENTS** The following documents are referred to in this Standard:

AS

1939 Degrees of protection provided by enclosures for electrical equipment (IP Code)

4024 Safeguarding of machinery

4024.1 Part 1: General principles

4024.2 Part 2: Installation and commissioning requirements for electro-sensitive systems — Optoelectronic devices

AS/NZS

3108 Approval and test specification — Particular requirements for isolating transformers and safety isolating transformers

IEC

61496 Safety of machinery — Electro-sensitive protective equipment

61496-1 Part 1: General requirements and tests

61496-2 Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)

**1.5 DEFINITIONS** For the purpose of this Standard, the definitions given in AS 4024.1, AS 4024.2 and those below apply.

**1.5.1 Area of detection**—the area within which a response to the specified test piece will take place.

**1.5.2 Automatic check interval**—the maximum time between completions of successive automatic or inherent checks made to ensure that the sensing unit is operating within the manufacturer's specification.

**1.5.3 Bottom stop**—a position in the stroke of, for example, power presses and similar closing machines at which the dangerous parts are automatically stopped and the guard muted, not more than 10 mm from the lowest possible position of the machine stroke. To obtain further closing movement, the starting control is released and reoperated and the sensing field subsequently restored to an effective condition prior to the next dangerous portion of the machine cycle.

NOTE: The term 'lowest' should be substituted with 'highest' in relation to up-stroking machines.

**1.5.4 Competent person**—a person whom the employer ensures has acquired through a combination of training, education and experience, the knowledge and skills that enable that person to correctly perform a specified task.

**1.5.5 Curtain object detection capability**—the minimum size of test piece which when placed anywhere at right angles into the sensing field will be detected, thereby causing the final switching devices to actuate.

**1.5.6 Final switching device**—the component of the electro-sensitive protective equipment which, when the sensing field or safety monitoring means are actuated, responds by interrupting the circuit connecting it to a machine primary control element. (See Figures 1.1 and 1.2.)

**1.5.7 Interface**—the sum of all the points of electrical interaction between the machine and the safety system.

**1.5.8 Lock-out condition**—a condition of the electro-sensitive protective equipment which is automatically attained both when its supply mains are interrupted and restored and in response to failure signals. From a lock-out condition normal operation can be achieved only by the actuation of a key operated control.

**1.5.9 Machine primary control element**—the electrically or other powered element which directly controls the machine's normal operating motion in such a way that it is last to operate when motion is initiated or arrested.

NOTE: Where more than one such element designed for all practical purposes to operate simultaneously is provided, each element is defined as a machine primary control element.

**1.5.10 Machine secondary control element**—a machine control element independent of the machine primary control element(s) and capable of removing the source of power from the prime mover of the relevant dangerous parts in an emergency.

**1.5.11 Non-contact safety devices with testing**—protective devices where the efficacy of the protective effect is tested within the device.

**1.5.12 Object size**—the size of the smallest object capable of being detected by the protective field of the electro-sensitive protective equipment.

**1.5.13 Safety monitoring means**—devices for generating signals to the safety system control unit to provide information on the status of the machinery, the machine primary control element(s), the final switching devices and the secondary switching device.

**1.5.14 Safety system control unit**—the unit that controls the monitoring of the sensing field, receives and processes information from the sensing field and the safety monitoring means and provides outputs to the final switching devices and secondary switching device.

**1.5.15 Secondary switching device** — the component of the protective equipment which, in a lock-out condition, interrupts the circuit connecting it to the machine secondary control element.

**1.5.16 Self-monitoring electro-sensitive protective equipment** — protective devices where the efficacy of the protective effect is monitored within the device.

**1.5.17 Shall** — indicates that a statement is mandatory.

**1.5.18 Should** — indicates a recommendation.

**1.5.19 Starting lock** — a device for preventing automatic starting after switch-on or after a change in the operation mode or type of operation.

**1.5.20 Starting test** — a compulsory test performed after the protective equipment has been switched on and before initiation of the first dangerous situation.

**1.5.21 Stopping performance monitor** — a type of safety monitoring means that is designed to be applied to a machine and to signal to the protective equipment whether or not the overall system response time or overall system stopping performance is within the preset limit(s).

**1.5.22 Switching command** — the command at the signal output of the electro-sensitive protective equipment which corresponds to the information 'protective field clear' or 'protective field not clear', and which is passed on to the control unit.

**1.6 LABELLING** The protective equipment manufacturer shall provide information which shall be marked on a permanent and durable label or plate on the outside of the equipment as follows:

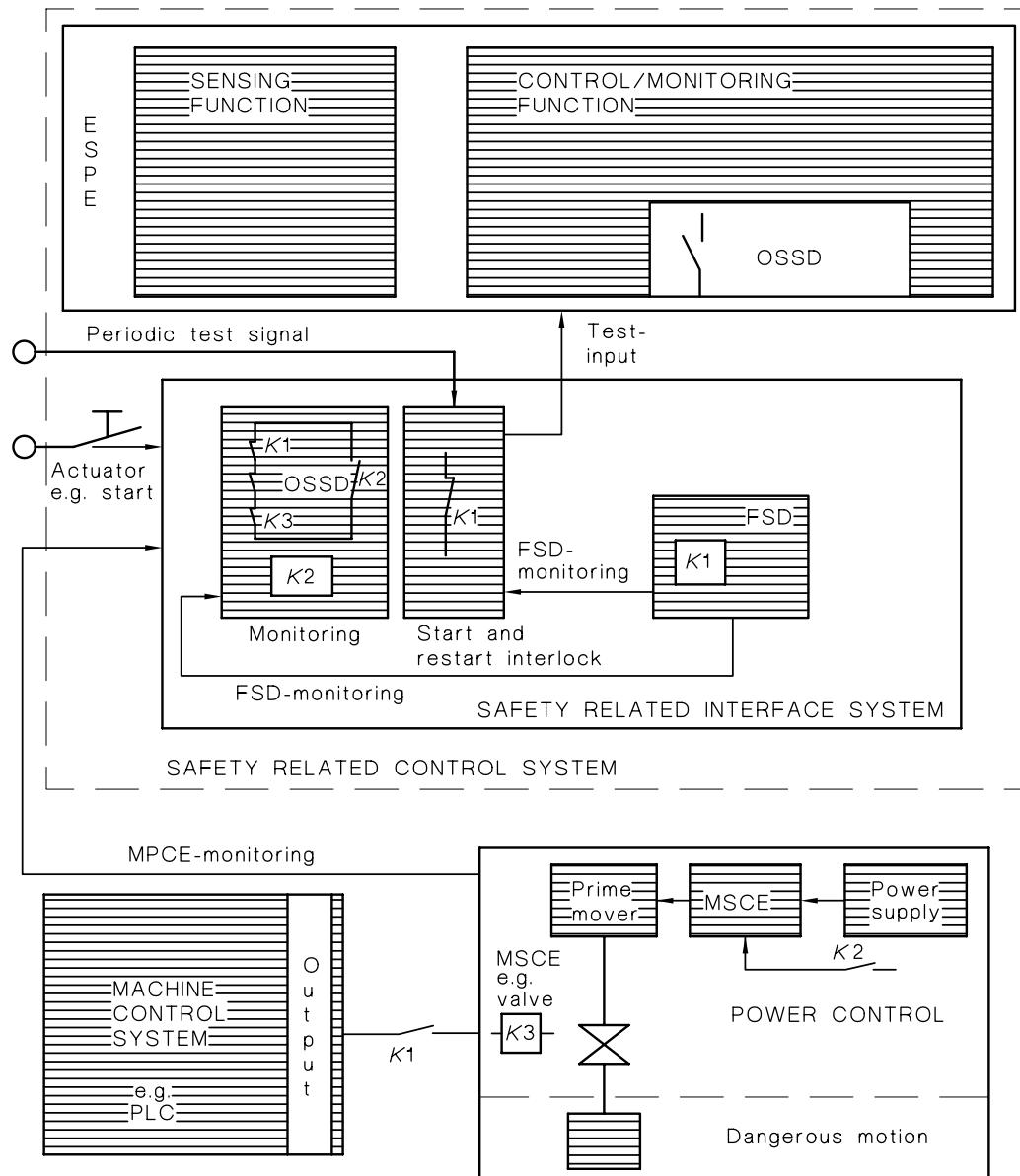
- (a) Year of manufacture.
- (b) Model or type.
- (c) Name and address of manufacturer.
- (d) Serial number.
- (e) Supply voltage and frequency.
- (f) Stopping performance.
- (g) A stipulation that components be replaced only by components known to be compatible with the remainder of the safeguarding system.
- (h) Where appropriate, the Standard to which the equipment was constructed and tested.
- (i) The category number in accordance with the safety related parts of the control system.

A separate clearly visible and permanent label fitted to the machine should state as appropriate —

- (i) the overall system response time or overall system stopping performance in milliseconds;
- (ii) the minimum separation distance in millimetres; and
- (iii) the appropriate test piece(s) diameter(s) in millimetres.

The minimum separation distance for the sensing field shall be specified in accordance with AS 4024.2.

**1.7 EQUIVALENT STANDARDS** Electro-sensitive protective systems employing optoelectronic devices that comply with the requirements of IEC 61496-1 and IEC 61496-2 shall be deemed to comply with this Standard.



## LEGEND:

ESPE = Electrosensitive protective equipment  
 OSSD = Output signal switching device  
 FSD = Final switching device  
 MPCE = Machine primary control element  
 MSCE = Machine secondary control element  
 PLC = Programmable logic controller

FIGURE 1.1 SCHEMATIC EXAMPLE OF INTERFACING A CATEGORY 2 ELECTRO-SENSITIVE PROTECTIVE EQUIPMENT TO A MACHINE CONTROL SYSTEM