

Logic units to ensure safety functions

EN ISO 13849-1	Safety-related parts of control systems - Part 1: General principles for design Safety functions for machines - the most important points in brief www.suva.ch/CE13-1.e
EN ISO 13849-2	Safety-related parts of control systems - Part 2: Validation
EN 62061	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
EN 61508-1 to 7	Functional safety of electrical/electronic/programmable electronic safety-related systems
EN 61800-5-2	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Function
EN 62745	Requirements for cableless control systems of machinery
Siemens SN 29500-1 to 16	Failure rates of components - Expected values for electromechanical and electronic components

Other standards in the context of safety components

The following regulations may also be relevant in connection with electrical hazards:

Directive 2014/35/EU relating to the making available on the market of electrical equipment designed for use within certain voltage limits

<http://data.europa.eu/eli/dir/2014/35/oj>

EN 60204-1	Electrical equipment of machines – General requirements Safety of machinery – the essential points on the electrical equipment of machines www.suva.ch/CE16-1.e
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The following regulations may also be relevant in connection with radiation hazards:

Directive 2014/30/EU relating to electromagnetic compatibility

<http://data.europa.eu/eli/dir/2014/30/oj>

EN 61000-6-1	Immunity for residential, commercial and light-industrial environments
EN 61000-6-2	Immunity for industrial environments
EN 61000-6-3	Emission standard for residential, commercial and light-industrial environments
EN 61000-6-4	Emission standard for industrial environments
EN 61326-3-1	Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications

Note: Higher requirements for safety components can often be found in the product standards specified above.

*(Link): hyperlink is shown in the PDF.

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Safety components for machinery - Main standards

Overview of frequently used standards with supplementary information

This **publication** is aimed at **manufacturers** and **integrators of safety components**.

Anyone wishing to place a **safety component** on the market must be able to prove that it complies with the provisions of the Machinery Directive 2006/42/EC and any other relevant regulations. This means that manufacturers are often faced with questions during the manufacturing process with regard to the technical guidelines, standards or rules to be applied.

With the help of the standards mentioned in the conformity declaration, an integrator can assess whether the safety component intended for installation complies with the relevant regulations. Reference is also made to standards in which the provisions for integrating the safety component into the machine are described.

According to **Article 2(c)** of the Machinery Directive, "**safety component**" means a component:

- which serves to fulfil a *safety function,
- which is independently placed on the market,
- the failure and/or malfunction of which endangers the safety of persons, and
- which is not necessary in order for the machinery to function, or for which normal components may be substituted in order for the machinery to function.

*EN ISO 12100, 3.30 Safety function: function of a machine, whose failure can result in an immediate increase of the risk(s)

A non-exhaustive list of safety components can be found in Annex V of the Machinery Directive (<http://data.europa.eu/eli/dir/2006/42/oj>). A few examples from this list:

1. **Guards for removable mechanical transmission devices.
2. **Protective devices designed to detect the presence of persons.
3. Power-operated interlocking movable guards designed to be used as safeguards in machinery referred to in items 9, 10 and 11 of Annex IV.
4. **Logic units to ensure safety functions.
5. Valves with additional means for failure detection intended for the control of dangerous movements on machinery.
6. Guards and protective devices designed to protect persons against moving parts involved in the process on the machinery.
7. Monitoring devices for loading and movement control in lifting machinery.
8. Emergency stop devices.
9. etc.

**These products are listed in Annex IV; the procedure for assessment of conformity under Article 12(3), (4) must be implemented. Logic units can be placed on the market under the following conformity scenarios in accordance with the Machinery Directive:

- safety component as defined in Article 2(c)
- component as part of a machine
- component as part of partly completed machinery
- independent components

For details, see guide to Machinery Directive, §417 *([Link](#)).

Safety components are to be placed on the market in accordance with Article 5 of the Machinery Directive.

In the guide to the Machinery Directive, §418 lists safety components differentiated according to whether they come under the scope of Annex IV or not. A few examples from this list:

Type of safety component	Annex IV
Proximity devices according to EN 60947-5-3	Yes, point 19
Wireless remote controls that provide at least one safety function, e.g. emergency stop	Yes, point 21
Power drive systems according to EN 61800-5-2 with one or more integrated safety functions (e.g. STO, SS1, SS2, SLS, SBC)	Yes, point 21
Protective devices for indirect detection of the presence of persons, e.g. by the use of radio frequency identification (RFID) technology	Yes, point 19
Position switches with direct opening action according to EN 60947-5-1, Annex K	No
Interlocking devices incorporating guard locking according to EN ISO 14119	No

For details and more examples, see guide to Machinery Directive, §418 *([Link](#)).

According to Article 1(2)(a) of the Machinery Directive, safety components intended to be used as spare parts to replace identical components and supplied by the manufacturer of the original machinery are **excluded from the scope of this Directive**.

Refer to standards for detailed safety aspects and requirements of safety components.

This publication is intended to provide an overview of frequently used standards. For the exact title of each standard, see the current excerpt from the Official Journal of the European Union *([Link](#)).

Principles for the integration of safety components

EN ISO 13850	Emergency stop function - Principles for design Schalteinrichtung in Maschinensteuerungen – Not-Halt-Geräte www.suva.ch/33066-04.d
EN ISO 13855	Positioning of safeguards with respect to the approach speeds of parts of the human body Sicherheitsanforderungen an Lichtvorhänge *(Link)
EN ISO 14118	Prevention of unexpected start-up Der Revisionsschalter www.suva.ch/CE93-9.d Unerwarteter Anlauf von Maschinen und Anlagen – Checkliste www.suva.ch/67075.d
EN ISO 14119	Interlocking devices associated with guards Schalteinrichtung in Maschinensteuerungen – Positionsschalter : www.suva.ch/33066/10.d Verriegelungseinr.: www.suva.ch/33066/16.d Schlüsseltransfer: www.suva.ch/33066/13.d
EN IEC 62046	Application of protective equipment to detect the presence of persons
IEC/TS 62998-1/-2	Safety-related sensors used for the protection of persons – Design, integration, examples

Electromechanical safety components

EN 574 EN ISO 13851	Two-hand control devices Schalteinrichtung in Maschinensteuerungen – Zweihandschaltungen : www.suva.ch/33066/08.d
EN 60947-5-5	Electrical emergency stop device with mechanical latching function
EN IEC 60947-4-1	Contactors and motor-starters - Electromechanical contactors and motor-starters
EN 60947-5-1	Control circuit devices and switching elements - Electromechanical control circuit devices
EN 60947-5-8	Three-position enabling switches Schalteinrichtung in Maschinensteuerungen – Zustimmeinrichtung www.suva.ch/33066/07.d
EN 61810-3	Relays with forcibly guided (mechanically linked) contacts

Protective devices designed to detect the presence of persons.

EN ISO 13856-1	General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors Schalteinrichtung in Maschinensteuerungen – Druckempfindliche Schutzeinrichtung www.suva.ch/33066/11.d
EN ISO 13856-2	General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars
EN ISO 13856-3	General principles for design and testing of pressure-sensitive bumpers, plates, wires and similar devices
EN 60947-5-2	Control circuit devices and switching elements – Proximity switches
EN 60947-5-3	Control circuit devices and switching elements - Requirements for proximity devices with defined behaviour under fault conditions (PDDb) Schalteinrichtung in Maschinensteuerungen – Lichtschranken und Lichtvorhänge www.suva.ch/33066/12.d
EN 61496-1	Electro-sensitive protective equipment - General requirements and tests
EN 61496-2	Electro-sensitive protective equipment - Particular requirements for equipment using active opto-electronic protective devices (AOPDs)
EN IEC 61496-3	Electro-sensitive protective equipment - Particular requirements for active opto-electronic protective devices responsive to diffuse reflection (AOPDDR)
IEC/TS 61496-4-2	Electro-sensitive protective equipment - Particular requirements for equipment using vision-based protective devices (VBPD) - Additional requirements when using reference pattern techniques (VBPDP)
IEC/TS 61496-4-3	- Additional requirements when using stereo vision techniques (VBPDST)