

Experimenting - Learning - Understanding

Safe functioning of machinery and plant - European machine guidelines made easy

Fundamental safety requirements in the manufacturing industry

Fundamental standards for safety-critical control functions

Design and risk evaluation for machines EN ISO 12100 Safety of machines	Risk knowledge General design guidelines Risk evaluation, part 2: Guidelines
EN 1500 (prEN ISO 14725-2) Safety of machines	
Functioning and safety requirements for safety-critical control systems	
Design and implementation of safety-critical control systems	
EN 12001:2005 Safety of machines Functional safety of critical safety, protection and programmable control systems	EN ISO 13849-1:2006 Safety of machines Safety-critical components of control systems, Part 1: General design guidelines Follow-up standard to EN 12001:2005. Transmits machine protection until the end of 2009
Any architecture Safety integrity level (SIL) SL 1, SL 2, SL 3	Intended architecture (redundant) Performance Level (PL) PL a, PL b, PL c, PL d, PL e
Electrical safety aspects EN 60204-1 Safety of machines	Electrical equipment for machines, Part 1: General requirements

Design and implementation of safety-critical control systems

Risk reduction strategy according to EN ISO 12100-1

An iterative process for determining measures to minimize risk.

1. Determine the tasks of the machine
2. Identify risks, estimate their effects and evaluate their importance
3. Estimate the risk for every hazard and hazard situation
4. Evaluate the risk and decide how to eliminate it
5. Determine safety or control the associated risk by means of safety
6. Design machine inherently safe design, technical protective measures, user instructions

EN 62061:2005 (Industry-wide standard following the recommendations of EC Directive)

EN ISO 13849-1:2006 (Follow-up to the transition standard EN 12001:2005)

Risk evaluation

Determining the relevant SIL

Determining the required PL

Design of safety functions and determination of safety integrity level attained

SIL	Probability of hazardous failure per hour (λ)	Performance level (PL)
SL 1	< 10 ⁻⁵ a or 10 ⁻⁷ a	a
SL 2	< 10 ⁻⁶ a or 10 ⁻⁸ a	b
SL 3	< 10 ⁻⁷ a or 10 ⁻⁹ a	c
SL 4	< 10 ⁻⁸ a or 10 ⁻¹⁰ a	d
SL 5	< 10 ⁻⁹ a or 10 ⁻¹¹ a	e

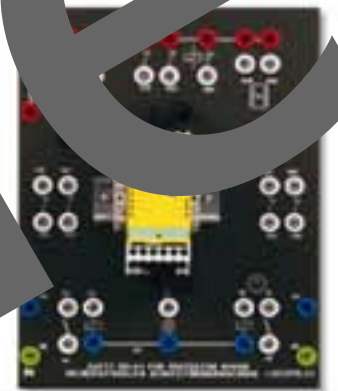
SIL and PL can be derived from one another

Validation on the basis of a validation

CE-Label (certification of conformity)



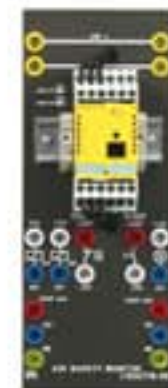
Protective door monitoring switch



Protective door monitoring with SIRIUS safety control unit



SIMATIC 57-300 with safety functions



AS-i safety monitor



SIRIUS safety control unit

The products used were taken from the Siemens „Safety Integrated“ series. Further information can be found online at www.siemens.de/safety-integrated.

www.lucas-nuelle.com
www.unitrain-i.com

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