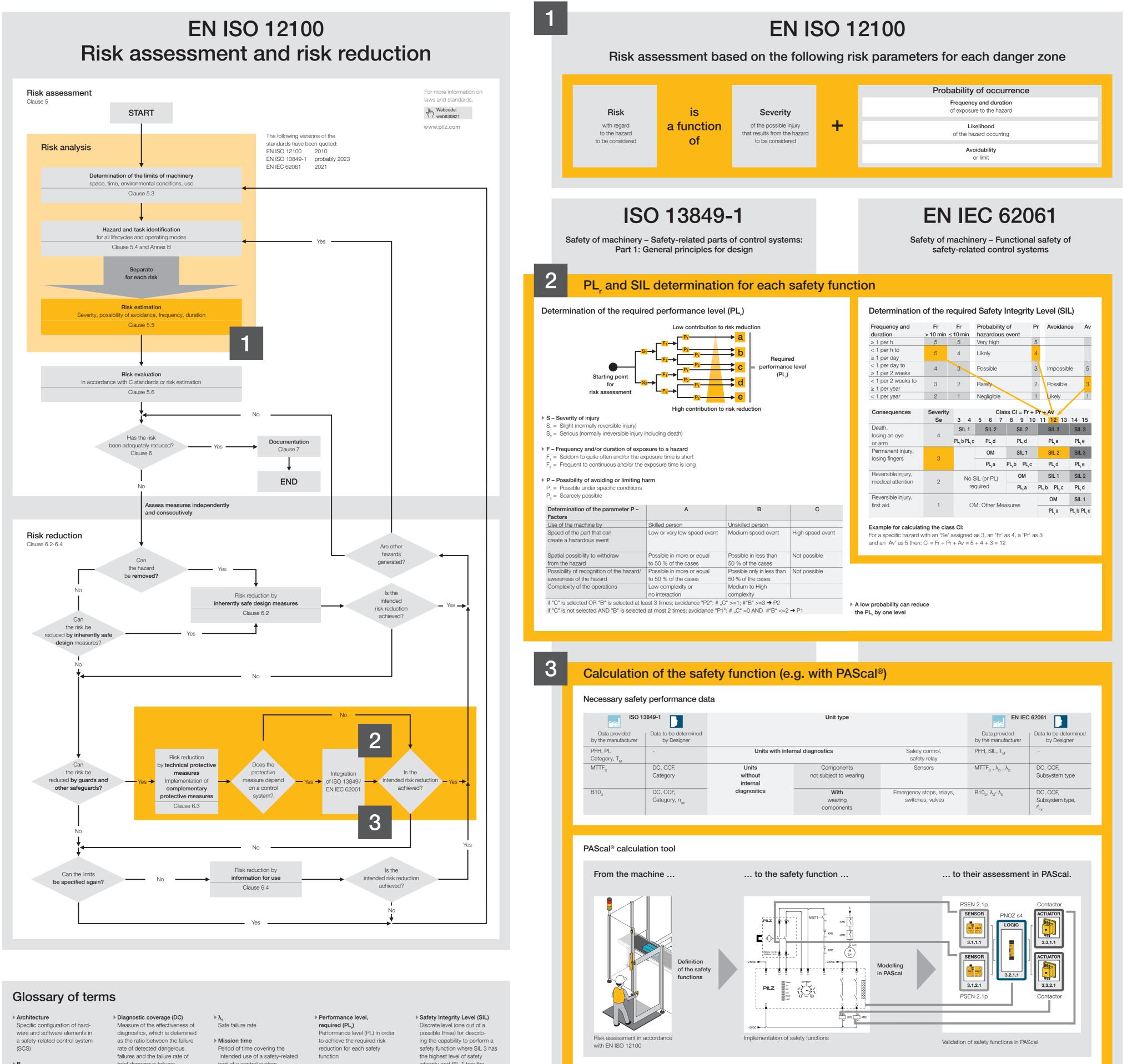
# Standards Functional Safety and Risk Assessment EN ISO 12100, ISO 13849 and EN IEC 62061





Glossary o	of terms
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<ul> <li>Architecture         Specific configuration of hard-ware and software elements in a safety-related control system (SCS)         B<sub>10D</sub>         Number of cycles of products     </li> </ul>	Diagnostic coverage (DC) Measure of the effectiveness of diagnostics, which is detemined as the ratio between the failure rate of detected dangerous failures and the failure rate of total dangerous failures	<ul> <li>λ<sub>s</sub> Safe failure rate</li> <li>Mission time Period of time covering the intended use of a safety-related part of a control system</li> </ul>	<ul> <li>Performance level, required (PL,)</li> <li>Performance level (PL) in order to achieve the required risk reduction for each safety function</li> <li>PFH</li> </ul>	Safety Integrity Level (SIL) Discrete level (one out of a possible three) for describ- ing the capability to perform a safety function where SIL 3 has the highest level of safety integrity and SIL 1 has the lowest
before 10% of the product range fails "dangerously"	DC <sub>avg</sub> Average diagnostic coverage	► MTTF <sub>D</sub> Mean time to dangerous failure	Probability of dangerous failure per hour	Safety-related control system (SCS)
Category Classification of the subsystem in respect to its resistance to faults and the subsequent behaviour in the fault condi-	Fault Abnormal condition that may cause a reduction in, or loss of, the capability of a functional unit to perform a required function	<ul> <li>n<sub>op</sub> Mean frequency of operation per annum</li> <li>Performance level (PL)</li> </ul>	Risk Combination of the probability of occurrence of harm and the severity of that harm	Part of the control system of a machine which implements a safety function by one or more "subsystems"
tion which is achieved by the structural arrangement of the parts, fault detection and/or by their reliability	►λ Average probability of failure	Discrete level to specify the ability of safety-related parts of control systems to perform a safety function under	Safety function Function of the machine whose failure can result in an immediate increase of the risk(c)	Subsystem Entity of the top-level architec- tural design of a safety-related system where a dangerous failure of the subsystem vaculta
CCF Common cause failure	▶ λ <sub>p</sub> Dangerous failure rate	foreseeable conditions	the risk(s)	failure of the subsystem results in dangerous failure of a safety function

Determination of the parameter P -	A	В	С
Factors			
Use of the machine by	Skilled person	Unskilled person	
Speed of the part that can	Low or very low speed event	Medium speed event	High speed event
create a hazardous event			
Spatial possibility to withdraw	Possible in more or equal	Possible in less than	Not possible
from the hazard	to 50 % of the cases	50 % of the cases	
Possibility of recognition of the hazard/	Possible in more or equal	Possible only in less than	Not possible
awareness of the hazard	to 50 % of the cases	50 % of the cases	
Complexity of the operations	Low complexity or	Medium to High	
	no interaction	complexity	

Category 4

 $10^{-6} \le \text{PFH} < 10^{-5}$ 

Specification of categories - examples of solutions

Category B,1	6320	Category 2	Category 3	EX103030
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The measures outlined on this sheet are simplified descriptions and are intended to provide an overview of the standards EN ISO 12100, ISO 13849-1 and EN IEC 62061. Detailed understanding and correct application of all relevant standards and directives are needed for validation of safety circuits. As a result, we cannot accept any liability for omissions or incomplete information.

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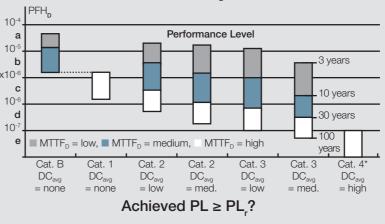


The solutions illustrated here are provided purely by way of example.

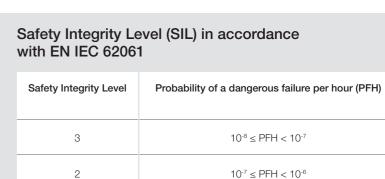
## Probability of a dangerous failure per hour - comparison PL/SIL

Performance Level (PL,) in accordance with ISO 13849-1

Relationship between the categories DC,  $\text{MTTF}_{D}$  and PL



\* In Cat. 4,  $\text{MTTF}_{D}$  up to 2,500 years is possible



Achieved SIL  $\geq$  required SIL?

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