HIXSON
ARCHITECTURE ENGINEERING INTERIORS

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From Experience

Safety Control System Standards: Comparing SIL, PL & Categories

Three primary standards are in place that define the level of a Safety Control System (SCS): Safety Integrity Level (SIL), Performance Level (PL), and Category Architecture. It is helpful to understand how these standard definitions correlate to each other, and the origin of these common safety definition standards. The SIL and PL are Hazard and Risk Assessment based, and were created and are maintained by the IEC and ISO, respectively. (See "Experience in Brief.") These are not the only standards used, but if another standard is used, it is usually converted to SIL or PL because they are ubiquitous. The Assessment of a System is conducted to assign a required PL or SIL, depending on which standard's approach is used. Only one standard may be used for a system because they do have nuances.

An easy way to compare these standards is to use Probability of Dangerous Failures Per Hour (PFH_d). Once the PL or SIL is determined, that is then related to an Architecture (or Safety Structure) to meet the PFH_d requirement. The most common Architectures, from the PL Standard, are called Categories. A Safety Category can be described as a classification of the safety-related parts of a control system with respect to their resistance to faults. In other words, a Category determines the components, the number of these components, and the circuit architecture of these components required to achieve the PFH_d.

Generally, the safer (higher) the SIL, PL, or Category, the more expensive the Design of the SCS will be. The table on the following page relates the PFH_d to each of the common definition standards used.

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EXPERIENCE IN BRIEF

- ISO: International Organization for Standardization.
- IEC: International Electrotechnical Commission.
- PL: Performance Level Value, ISO 13849 assessment approach.
- SIL: Safety Integrity Level Rating, IEC 62061 assessment approach.
- Category, ISO 13849 description of system architecture.

Probability of Dangerous Failures Per hour (PFH_d)	IEC 62061 Safety Integrity Levels (SIL)	ISO 13849-1 Performance Levels (PL)	ISO 13849-1 Recommended Safety Category
$10^{-5} < PFH_d < 10^{-4}$	N/A	a	b
$3x10^{-6} < PFH_d < 10^{-5}$	1	b	b
$10^{-6} < PFH_d < 3x10^{-6}$	1	c	1(*) or 2 (**)
$10^{-7} < PFH_d < 10^{-6}$	2	d	3
$10^{-8} < PFH_d < 10^{-7}$	3	e	4

* Well-tried safety components

** Well-tried safety principles

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