

FUNCTIONAL SAFETY



From components to complete systems, HYDAC can help you reach your functional safety goals. HYDAC's integration experts are with you every step of the way towards achieving a higher level of functional safety while at the same time maximizing the effectiveness of your system. This summary explains functional safety basics and how HYDAC can be your partner for success.

DEFINITIONS AND TERMINOLOGIES:

- **Risk** – Probability of damage occurring and the degree of damage including persons, environment, production facilities, reputation, etc.
- **Safety** – the freedom from intolerable risks
- **Functional Safety** – portion of the overall system safety which depends on the correct function of safety-critical systems for the reduction of risks in order to maintain a safe system condition.
- **The Machinery Directive** – 2006/42/EC, now incorporated into the EN ISO 13849-1.

Need to Know Functional Safety Terminology

- SIL – Safety Integrity Level per IEC 61508, EN 62061
- PLr – Performance Level per ISO 13849
- AgPLr – Performance Level per ISO 25119
- MTTFd – Mean Time To dangerous Failure
- PFHd - Probability of dangerous Failure per Hour
- DC – Diagnostic Coverage
- CCF – Common Cause Failure
- HAZID, HAZOP - Hazard Identification and Risk assessment, hazard and operability study

What it is:

- A consideration of the entire system including its intended use, potential misuse, and the environments with which it interacts as well as:
 - Entire scope of operation
 - Transport
 - Service
- A living process that evolves throughout the design all the way through launch
- Includes electrical, electronic and programmable electronic systems (E/E/PE) and extends to non-E/E/PE that the E/E/PE actuates, controls, or monitors
- A Quantitative assessment of risk reduction for the machine

What it is not:

- Not determined by individual system components
- Not based only on intended or recommended use
- Not a punch list

Why it exists and why it's important to US manufacturers:

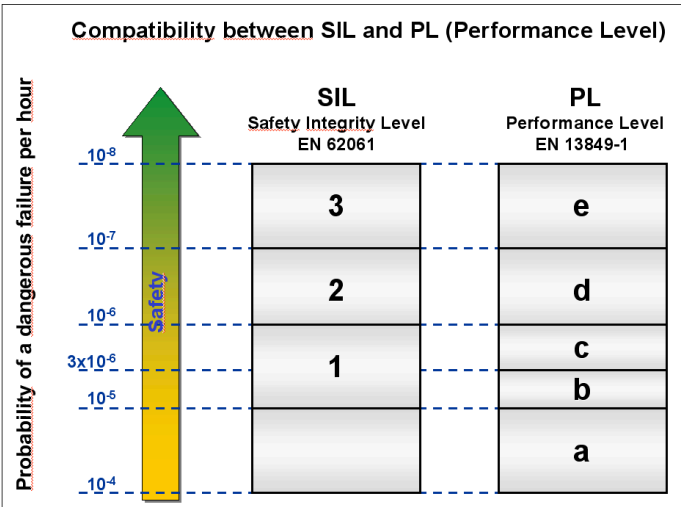
- The Machinery Directive for any equipment sold into the EU, must be CE certified and adhere to their respective safety standards.
- Therefore, any U.S. manufacturer who exports to the EU will need compliance and this could (and should) apply to domestic manufacturing as well.
- Legal Principles
 - Manufacturer must satisfy special requirements of due diligence
 - Reverse burden of proof - if a safety defect can be demonstrated, circumstantial evidence is sufficient.
 - Due diligence and all pertaining documentation must be presented to prove all measures and instances were accounted for in good faith

Relevant Regulations and Standards

- Basic Safety Standards (type A)
 - Design principles and general aspects for machines over entire life cycle
 - IEC 61508 (Functional Safety of E/E/PE)
 - (1) Standard consists of 7 sections
 - (2) Adopted in 2001
 - (3) Determining Safety Integrity Levels is the essential element (SIL 1 to SIL 4)
 - To be performed and documented in the following order
 - (1) Safe design
 - (2) Technical safeguards
 - (3) User information
- Safety Group Standards (type B)
 - Apply to a wide range of machinery
 - Provide guidance one or more safety aspects or safeguards
 - EN ISO 13849-1 (safety-related parts of control systems)
 - (1) Identifies Performance Levels (PL A to E)
 - (2) Comparable to SIL levels when discussing Mean Time to Dangerous Failure, MTTD



Any equipment sold into the European Union must be CE certified. Therefore, any U.S. manufacturer who exports to the EU will need to comply to this certification and as such, it could (and should) also apply to domestic manufacturing as well.



- Cover all technologies, mechanics, pneumatics, hydraulics, and electrics
- Safety Product Standards (type C)
Machinery safety standards
 - (1) Most specific
 - (2) Detailed safety requirements for particular machines or groups of machines

EC DECLARATION OF CONFORMITY

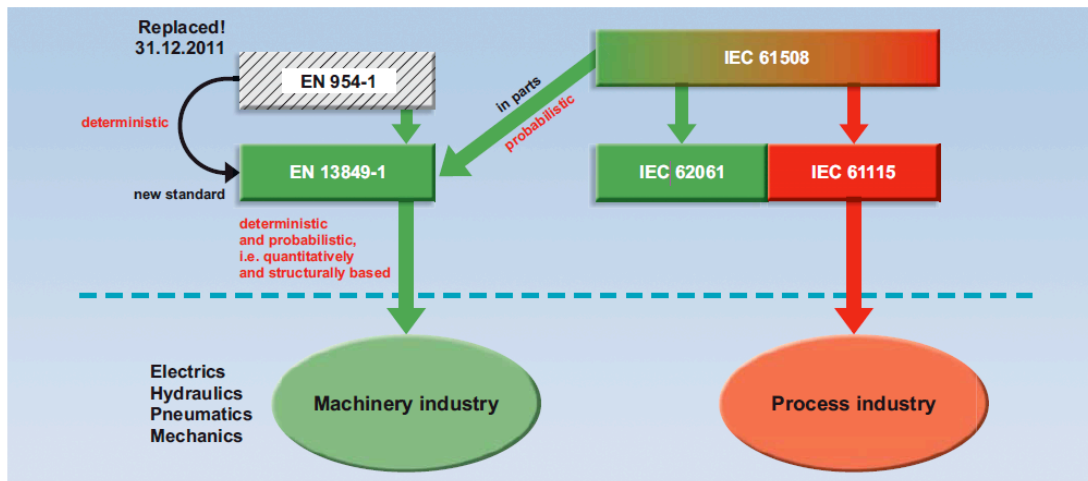
The manufacturer confirms to comply with the following guidelines:

- Machinery Guidelines – 2006/42/EG
- Noise Emission Standards – 2000/14/EG
- Electromagnetic Compatibility Standards – 2004/108/EG



While no single product can ensure functional safety, HYDAC offers the tools needed for a complete and robust system with products such as:

- Electronics
- Breathers
- Filtration
- Accumulators
- Compact Hydraulics
- Mobile valves



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