Device selection for Safety Instrumented Functions (SIFs)

Safety Instrumented Systems (SIS) are found on the vast majority of process industry manufacturing facilities to protect against hazards to personnel, the environment and plant equipment.

The focus of correct safety device selection is to obtain a high confidence level that the instrumentation specified for a Safety Instrumented Function (SIF) meets the functional requirements under operational constraints and the selected device is sufficiently reliable for the target SIL. Both aspects require proper evidence to be available and recorded as a justification to meet the requirements of the IEC safety standards and regulator, business insurer expectations.

From the IEC 61508/61511 standards, the Safety Integrity Level is one of fundamental concept in ensuring a safety instrumented system (SIS) satisfactorily performs the required safety functions under all stated conditions within a defined time period. For any SIF forming part of the SIS, the devices making up the end to end SIF architecture i.e. the sensors, logic solver and final elements will need to be properly specified and verified as being fit for purpose.

In contrast, properly specified safety devices will ensure risk reduction measures to be implemented by the SIF are realized at the technology level and can be verified to meet application specific requirements.

Background to the ABB approach

ABB’s safety device specification and assessment service supports independent verification for safety device specification regarding fit for purpose requirements and assessment of the safety device manufacturer’s capability claims. Asset owners and EPCs partner organisations can increase their assurances of the use of such devices in the context of Functional Safety, and to then confidently approve the safety device for use in one or more SIFs commensurate to the SIL level, configuration and operational lifetime required to achieve the necessary risk reduction targets.
Safety device specification
Effective safety device specification and selection requires the user to assess the specific device safety manual and supporting failure rate data and technical certification. Utilizing a competent assessor, ABB can provide effective and impartial guidance to obtain maximum benefit for the independent device review and approval outcome.

By understanding the role of the safety device to meet safety function requirements, the ABB assessor will verify the use of the device against the following criteria:

- Operating environment and environmental constraints
- Failure rate data
- Compliance to IEC 61508 / 61511 (direct or prior use)
- Safe and dangerous failure rate published data changes based on application duty and device settings e.g. under / over range
- Hardware Fault Tolerance (HFT) and Systematic Capability (SC) claims
- Requirements for operation including process hook up and utilities
- Requirements for inspection and maintenance
- Requirements for proof testing
- Useful life and replacement
- Modes of behaviour for the device when integrated into the proposed end to end SIF

Recording the outcome of the device specification and selection process in an efficient and sustainable way provides a means to support future SIL verification and for periodic reviews and assessments of key data and assumptions.

Benefits of independent device specification and selection
- ABB offers its clients an extensive knowledge of SIS, detailed safety device application, the legislation concerned, the regulatory perspective and also the standards / criteria against which safety device verification will be measured
- Demonstration that effective and robust safety device specification and selection is being taken shows the pro-active attitude which is expected by both internal and external company stakeholders
- Optimises the cost of safety for both Capex and Opex regarding safety device specification, section, verification and appropriate operational mission time requirements

ABB services
Where improvements are felt to be appropriate, ABB services support the entire safety lifecycle, providing safety requirements assessments, development of FSM systems, design and procurement of new systems, safety lifecycle support tools and training for your key staff.