

Safety Instrumented Systems (SIS)

IEC 61508-IEC 61511 operation and maintenance fingerprint



Do your company standards ask for specific requirements to manage the maintenance, testing, reporting inspection and analysis of your safety. Do you know if you can 'demonstrate' compliance to IEC 61511 / IEC 61508 and regulatory expectations? Do you require a defined lifecycle management structure to support stage 4 functional safety assessment for your SIS?

Effective SIS operation, maintenance, inspection and proof testing should confirm the correct operation of the sensing device(s) through the logic solver to the actuating devices and in doing so, detect dangerous hidden faults in a SIS.

Within the process industries today there are known to be a wide range of techniques and methods adopted by the end-user community in their approach to SIS operation, maintenance, inspection, proof testing and modification. There is too, the desire to comply with industry good practice standards such as IEC 61508 and IEC 61511. These standards show that the SIFs are being operated, maintained and tested in accordance with details identified within the original safety requirements specification and its subsequent change management revision over time. During planned site visits, regulatory authorities are increasingly showing an interest in the duty holders operation, maintenance, proof testing and change management regimes and in particular documented evidence of IEC 61511 stage 4 FSA.

To support our clients in this important functional safety management requirement, ABB has developed an O&M compliance management methodology supported by the ABB Fingerprint software Tool for evaluating the organisation's current operation, maintenance, inspection, proof testing and modification management practices. This 'Fingerprint' methodology establishes a number of detailed judgements on where gaps in compliance to the safety standards and industry good practice recommendations are significant. The methodology applied also supports the management process and document structure for the requirements of the IEC 61511 stage 4 periodic FSA. Our in-depth understanding of the principles involved together with our work for the UK HSE and experience with practical application, means that we are able to offer an 'SIS O&M Fingerprint' to determine what actions need to be taken to ensure the level of safety designed into the system is being operated and maintained effectively.



Background to the ABB approach

Historically, the way in which safety instrumented systems have been operated and maintained can vary significantly. Essentially whatever methodologies are deployed within the operation, the use of a maintenance, inspection and proof test protocol is required to identify and expose any unrevealed fail-to-danger fault conditions. 'End to end' proof testing should be designed to detect unrevealed faults in all SIS parts including sensors (and process connections), logic solver and final elements. Where overrides are applied to the SIS, they should be subject to strict controls to ensure their safe application and timely removal. Where the partial testing of the SIS or a device of the SIS is adopted, the impact on process operation, functional safety and overall test coverage must be established by risk assessment and mitigated where necessary. If failures are detected during the proof test then adequate measures are taken to manage any additional risk during the recommended repair time.

When modifications are applied to the SIS, the requirements for change management, impact assessment and functional safety assessment will need to be implemented. The basis of safety will need to be re-evaluated and the SRS updated along with the current 'As Built' documentation. Preventative and corrective maintenance measures will need to be scheduled and executed in accordance with device safety manuals and cyber security requirements. To support successful management and delivery of the necessary SIS inspection, maintenance and proof testing regime, ABB, has developed a set of management and technical O&M principles based on extensive operating experience to benchmark against industry good practice expectations for what is reasonable and practicable to expect while operating, maintaining and testing this important layer of protection.

The ABB approach

The fingerprint tool is a structured approach that makes use of existing organisational Functional Safety and operations and maintenance management systems, industry and regulatory research reports and extensive plant operational experience.

The O&M Fingerprint comprises a series of management, operational, technical and maintenance principles forming a collection of all relevant requirements and guidelines from the relevant industry standards for O&M; an approach that covers the following topics:

- Functional Safety Management (FSM)
- Competency assurance
- Assessment, audit
- Management of Change (MoC)
- Human factors
- Alarm management
- Access and cyber security management
- Operational pre-start-up activities
- Operation
- Maintenance
- Proof testing
- Ageing plant

These principles are underpinned by a series of factors and prompts. Both the principles and underpinning factors are ranked in accordance with compliance to IEC 61511 and importance. This systematic scoring and ranking from the results of the on-site findings as developed by the ABB assessment methodology, provides the basis of the reporting requirements, followed by comparison of the assessment findings with industry-consensus practical steps, and is further developed to yield a compliance fingerprint report to specify any necessary improvements.

Benefits of a SIS O&M fingerprint

ABB offers its clients extensive knowledge of safety instrumented systems, the legislation concerned, the regulatory perspective and also the standards / criteria against which a company / system is measured. Benchmarking your current SIS operation, maintenance, inspection, proof testing and change management methodology can support a justification of compliance with FS standards requirements and help devise a practical improvement plan. An ABB O&M Fingerprint helps select the most cost-effective solutions for improvement and alignment to industry good practice including:

- A defined assessment and review process for supporting overall stage 4 periodic FSAs in accordance with IEC 61511 clause 5.2.6.1.10
- Demonstration that action is being taken showing the pro-active attitude which is expected by the authorities, public and workforce, and supports company risk management arguments and traceability to industry good practices
- Knowing in advance the changes that will have to be made aids planning and avoids 'surprises' regarding the on-going sustainability of the operation
- Providing information on how to maintain the level of safety designed into the SIS
- Reducing the plant spurious trip rate and cost of its consequences
- Giving evidence to authorities that normative requirements and good practice on SIS management are presented in a O&M fingerprint report with recommended follow-up actions
- Highlighting the areas in most need of improvement, whilst in some cases relaxing the demands on resources by using the ABB Fingerprint risk-based approach

ABB FSM Technical Authority

Where improvements are felt to be appropriate, ABB FSM TA services support the entire safety life cycle, providing safety requirements development, production of FSM systems, design and procurement of new SIS solutions, safety life cycle design and operational management support tools and industry leading FS related training for our customers.

Assured and certified products, services, delivery and execution.

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