Safety Integrity Level (SIL) & Safety Instrumented Systems (SIS) Design Training Course

19 – 23 April 2027
Düsseldorf (Germany)



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Introduction:

This Safety Integrity Level SIL & Safety Instrumented Systems SIS Design Training Course equips you to analyse process hazards, determine target safety integrity levels, and engineer compliant safety instrumented functions across one week. You will build a complete SIS Design and SIL Verification Dossier containing safety requirements specifications, reliability calculation sheets, and lifecycle validation plans. You need a baseline background in process instrumentation or plant control engineering, as this practitioner course advances directly into system architecture and functional reliability modelling. You will practise through a modelling build, calculating failure probabilities and verifying hardware fault tolerance using industry-standard engineering formulas.

Course Objectives:

- Build calibrated risk graphs and layer of protection analysis worksheets using IEC 61511-3 methods on plant hazard scenarios.
- Draft safety requirements specifications using IEC 61511-1 clause 10 requirements on critical emergency shutdown loops.
- Calculate average probability of failure on demand and spurious trip rates using IEC 61508 reliability formulas on multi-channel architectures.
- Score hardware fault tolerance and architectural constraints using IEC 61511-1 route 1H and 2H guidelines on sensor and actuator subsystems.
- Test proof test coverage and maximum inspection intervals using SAES-J-601 criteria and SAEP-250 parameters on safety loop models.

Target Audience:

- You design process automation, emergency shutdown logic, and protective interlocks across industrial operating facilities.
- You specify field instrumentation, final control valves, and logic solvers within engineering design and procurement teams.
- You conduct process hazard analyses, layer of protection assessments, and risk evaluations within plant safety departments.
- You oversee maintenance schedules, proof testing execution, and instrumentation reliability records within production operations.



Course Outline:

Day 1: Analysing Process Hazards and Allocating SIL Targets

- Mapping Functional Safety Lifecycle Stages Using IEC 61511-1
- Assessing Initiating Event Frequencies Using Layer Of Protection Analysis
- Determining Required Safety Integrity Levels Using Calibrated Risk Graphs
- Evaluating Protection Layers Using Independent Protection Layer Validation Rules
- Build: Hazard Identification and Target SIL Allocation Model

Day 2: Developing Safety Requirements Specifications and Architectures

- Drafting Functional Safety Boundaries Using SABP-Z-076 Requirement Sheets
- Defining Safe Process States Using IEC 61511-1 Clause 10
- Selecting Redundant Subsystem Architectures Using Hardware Fault Tolerance Tables
- Specifying Field Sensor Isolation Points Using SAES-J-601 Tapping Rules
- Build: Safety Requirements Specification and Architecture Template

Day 3: Modelling Reliability and Calculating Probability of Failure

- Calculating Failure Rates Using IEC 61508 Failure Mode Data
- Modelling Subsystem PFDavg Metrics Using 1oo1 And 1oo2 Formulas
- Computing Common Cause Failures Using The Three Percent Beta Factor
- Determining Voting Degradation Effects Using 2oo3 Logic Solver Configurations
- Build: SIF PFDavg Calculation and Hardware Reliability Model

Day 4: Structuring Proof Testing and Managing Operational Integrity

- Scheduling Periodic Valve Proof Tests Using SAEP-250 Interval Rules
- Designing Partial Stroke Testing Workflows Using Smart Positioner Diagnostics
- Governing Emergency Shutdown Bypasses Using Management Of Change Procedures
- Auditing System Safety Documentation Using HCIS SAF-01 Submission Frameworks
- Build: Proof Test Strategy and Lifecycle Integrity Matrix

Day 5: Modelling Verification Dossiers and Finalising Loop Assessments

- Verifying Architectural Fault Tolerance Using Route 2H Prior Use Data
- Evaluating SIF Spurious Trip Rates Using Mean Time To Failures
- Reconciling Tightened PFDavg Targets Using SAEP-250 SIL Derating Thresholds
- Validating SIF Diagnostic Coverage Using IEC 61511-2 Verification Checklists
- Build: SIS Design and SIL Verification Dossier



Skills You Will Gain:

- Layer of Protection Analysis LOPA
- Calibrated Risk Graph Assessment
- Safety Requirements Specification SRS Authoring
- PFDavg Mathematical Reliability Modelling
- Hardware Fault Tolerance HFT Verification
- Proof Test Coverage Determination
- Spurious Trip Rate STR Calculation

Why Attend This Course:

- Determine target safety integrity levels systematically by applying calibrated risk graphs and layer of protection analysis directly to plant process hazard scenarios.
- Calculate system probability of failure on demand and spurious trip frequencies using standard mathematical formulas for voting architectures.
- Build a robust SIS Design and SIL Verification Dossier that demonstrates compliance with international safety standards and engineering procedures.
- Establish rigorous proof testing schedules and management of change protocols that preserve safety instrumented function reliability throughout plant operation.

Conclusion:

Returning to your organisation, you will immediately use the SIS Design and SIL Verification Dossier to review your facility's active safety loop documentation and audit existing reliability calculations. You will present the completed SIL verification models and updated safety requirements specifications to your engineering manager, technical safety leads, and operations superintendents for formal adoption. Following its first deployment on an operating unit or expansion project, you will check sensor proof test intervals and diagnostic coverage assumptions against actual field failure data to confirm design integrity.

Frequently Asked Questions FAQ:

What will you be able to do after the Safety Integrity Level SIL & Safety Instrumented Systems SIS Design Training Course?

You will be able to perform SIL determination using calibrated risk graphs and LOPA, draft safety requirements specifications, design compliant SIS architectures, and calculate PFDavg reliability figures to verify safety instrumented loops in line with IEC 61511.



What do you need to know before starting the Safety Integrity Level SIL & Safety Instrumented Systems SIS Design Training Course?

You need foundational familiarity with industrial process instrumentation, basic control loops, and standard piping and instrumentation diagrams. Previous experience with process hazard identification methods provides a helpful base, but advanced reliability mathematics is taught directly within the course.

What do you build during the Safety Integrity Level SIL & Safety Instrumented Systems SIS Design Training Course?

You build an SIS Design and SIL Verification Dossier. This working deliverable integrates target SIL allocation matrices, a formal safety requirements specification, quantitative PFDavg calculation models, hardware fault tolerance evaluations, and proof test procedures for production facilities.

How does the Safety Integrity Level SIL & Safety Instrumented Systems SIS Design Training Course differ from a general process safety management course?

This course focuses strictly on the technical engineering, mathematical reliability modelling, and architectural design of instrumented safety systems under IEC 61511. General process safety management courses cover broader administrative programmes, operational safety culture, hazard communication, and plant-wide environmental health policies.

