



Safety Instrumented Systems (SIS) Training

Functional Safety Engineer (TÜV Rheinland)

C & C Technical Support Services is an accepted course provider of the worldwide acknowledged TÜV Rheinland Functional Safety Training Program.

General Information about this training

This training focuses on functional safety aspects for process, oil & gas, petrochemical and chemical industries according to IEC 61508 / IEC 61511. This includes the complete safety lifecycle in the context of Safety Instrumented Systems (SIS) projects.

This 5 days course comprises 4 days of classroom tuition and practical guidance, for understanding and mastering the application, principles and requirements of Edition 2 IEC 61508 & Edition 2 of IEC 61511 for SIS. **We also include many fundamental topics that we know you need to understand, but are not covered in the standards.** Practical exercises will be performed throughout the course based on real life examples. There is a 5 hours competency examination on the last day. The training documents would be bilingual, **English and Chinese.**

Who should attend?

Instrument Engineer, Process Engineers, Process Safety Engineers and Safety Engineers as well as senior Operating and Maintenance personnel who are involved in any of the safety lifecycle phases for safety instrumented systems from hazard and risk analysis through design of shutdown systems/fire and gas systems to installation, commissioning, testing and maintenance.

Participant Eligibility Requirements

In accordance with the TÜV Rheinland Functional Safety Training Program:

Participants should have a minimum of **3 years** of experience in the field of functional safety **and** a University degree or equivalent engineering experience and responsibilities as certified by their employer or engineering institution.

Certificate

Participants, who fulfil the requirements, attend the complete training and successfully pass the exam will get the **FS Engineer (TÜV Rheinland)** certificate with an individual ID number.

Holders of this certificate will be listed at the TÜV Rheinland website www.tuvasi.com at the 'List of FS Engineers'.



Beijing:

September 4th - 8th, 2017

Course Agenda

Part 1

Part 1 covers process hazard analysis and associated risk management using the most popular and internationally adopted methods and tools. Such hazards can lead to loss of life, damage to their asset, loss of production and profitability, damage to the environment and company reputation. Participants will be introduced to the concepts of the main international standards that cover this area of risk assessment and risk reduction.

Content

- ✓ IEC61508 and IEC61511 background
- ✓ Hazards, Risk and ALARP principles
- ✓ Risk Reduction and mitigation
- ✓ Safety Instrumented System (SIS) and Safety Instrumented Functions (SIF)
- ✓ Types of SIF
- ✓ Integrity specification of a SIF
- ✓ Primary & secondary functions
- ✓ SIL Determination by risk graphs
- ✓ SIL Determination Exercises
- ✓ Layer of Protection Analysis (LOPA)
- ✓ SIL determination using LOPA
- ✓ LOPA Exercise
- ✓ Fault Tree Analysis (FTA)
- ✓ SIL Determination by (FTA)
- ✓ FTA Exercises
- ✓ Case Studies with typical findings and issues

Part 2

Part 2 will take participants through the requirements for a Safety Requirement Specification (SRS) and show how to undertake appropriate cost effective designs for Safety Instrumented Systems (SIS) and Safety Instrumented Functions (SIF), and how optimal test and maintenance strategies for them can be achieved. Participants will be instructed in methods for calculating the Probability of Failure on Demand (PFD), the Probability of Failure per Hour (PFH), Safe Failure Fraction and Hardware Fault Tolerance. The concepts of failure modes, reliability and the influence of Common Cause Failures will also be covered.

Content

- ✓ SIS Safety Requirements Specification
- ✓ Selection of Components and Subsystems
- ✓ Proven in use (Prior Use)
- ✓ Field Devices used in SIS
- ✓ Systematic Failures
- ✓ Random Failures
- ✓ Failure and Reliability
- ✓ Demand Modes
- ✓ Probability of Failure on Demand (PFD)
- ✓ PFD Exercises
- ✓ SIF Implementation (Low demand)
- ✓ Importance of Testing and Maintenance
- ✓ Fractional Dead Times
- ✓ Partial Closure Testing of Valves
- ✓ The Impact of Common Cause and Common Mode Failures
- ✓ Safe Failure Fraction and Hardware Fault Tolerance
- ✓ SFF Exercises
- ✓ Calculating PFD for Low Demand Systems with Diagnostics
- ✓ Calculating PFH for High and Continuous Demand Systems with Diagnostics
- ✓ Reliability Data

Part 3

Part 3 will cover application software requirements for safety instrumented systems (SIS) and the relationships between hardware and software architecture. This will include the development of application software specification, module testing requirements and integration with other SIS subsystems. This final day of tuition will also include techniques for undertaking more advanced SIL determination and methods for solving more complex safety instrumented functions.

Content

- ✓ Software requirements
- ✓ Relationships between Hardware and Software Architecture
- ✓ Application Software Requirements Specification
- ✓ Application Software Validation Planning
- ✓ Application Software Architecture
- ✓ Requirements for Support Tools, User Manuals and Application Language
- ✓ Application Software Development
- ✓ Application Module Testing
- ✓ Integration of Application Software with SIS Subsystems
- ✓ FPL and LVL Software Modification procedures
- ✓ Application Software Verification
- ✓ Factory acceptance Testing
- ✓ Installation and Commissioning
- ✓ Site Acceptance Testing and Validation
- ✓ SIF Interaction with Other Technologies
- ✓ Primary & Secondary Functions
- ✓ Intermediate Trips
- ✓ Risk Graph Calibration
- ✓ Fire and Gas Systems
- ✓ SIS Overrides
- ✓ Maintenance
- ✓ Modifications and Change Control
- ✓ Document Control
- ✓ Course summary

Exam on day 5

A five (5) hour two part proficiency assessment comprising:

- Part 1 = 70 multiple choice questions (1 mark each question);
- Part 2 = 10 multiple part questions (3 marks each question).

The pass score criterion is 75%.

Paper copies of IEC 61508 and IEC 61511 are permitted in the exam and also a bilingual dictionary if required.

Course notes, telephones, I-phones, I-pads, laptops or other personal computers are NOT permitted in the exam.

A scientific calculator will be required for the course and the exam.

Course Instructors

Clive Timms

*Functional Safety Expert
(TÜV Rheinland)*



Clive has over 46 years of experience in the petrochemical industry with offshore and onshore plants experience. He retired from Shell UK Exploration and Production in 2001 where he was Head of Automation and Control. He was a director of Asset Integrity Management Limited between 2001-2007 developing IEC 61508/61511 related software tools for SIL determination, SIS design and maintenance/test interval calculations, along with supporting consultancy and training services. He was also a founder director of the Conformity Assessment of Safety Systems (CASS) Scheme Limited, which promotes a UKAS approved scheme for the assessment of compliance against IEC 61508

He is now a co-director of C & C Technical Support Services Ltd who specialise in the application of and training for the IEC61508 and IEC61511 standards. He chaired the UKOOA working group that produced the UKOOA Guidelines for Instrument-based Protective Systems, as an offshore sector interpretation of IEC61508. He is a Chartered Engineer with a BSc. and MPhil in Control Engineering; he is a Fellow of the Institute of Measurement & Control, a Member of the IET and a Functional Safety Expert (TÜV Rheinland).

Past Chairman of the UKOOA Instrumentation and Control Group
Past Chairman of the Institute of Measurement & Control
Safety Panel for more than 12 years

Publications Include:

- A Methodology for Alarm Classification and Prioritisation – IEE: People in Control, June 1999.
- IEC 61508 is it Pain or Gain? – Measurement & Control, Volume 35, July 2002..
- IEC 61511- an aid to COMAH and Safety Case Regulations compliance – IEE: IEC 61511 Roll-Out Seminar December 2003.
- How to Achieve 90% of the Gain without Too Much Pain. – Measurement & Control, Volume 37/1, February 2004.
- Determination of Safety Integrity Levels Taking Into Account ALARP- Cost Benefit Analysis – IChemE: Hazards XIX, March 2006.
- Achieving ALARP with Safety Instrumented Systems – Measurement & Control, Volume 39/10 December 2006.
- Hazards Equal Trips or Alarms or Both – Process Safety and

Simon Clarke

*Functional Safety Expert
(TÜV Rheinland)*



Simon has over 16 years of experience in the upstream Oil & Gas Industry with on and offshore plant experience. He specializes in the application of Functional Safety and Process Dynamics for Safe process design. He has significant design and operational experience which has allowed him to become a skilled leader of PH&RA methods with effective specification and design of process plant safeguarding systems. Simon has a unique blend of Process, Instrumentation and Safety Engineering skills. This allows him to give clear explanations enhanced by many real life examples for a wide area of the lifecycle. This in depth knowledge and experience aids clarification of the fundamental concepts of the standards as well as the more and difficult areas, in the context of process plant applications. Simon has significant experience in Functional Safety Assessments (FSAs) and has authored the world's first paper on the earlier stage assessments (FSA-1).

Simon is now a co-director of C&C Technical Support Services Ltd, which specializes in the application of the IEC61508/61511 standards in Functional Safety and the application of new technology in process safety and the automation industry. He has a 1st Class Honours Degree in Chemical Engineering, an MSc in Process Systems Integration, is a Chartered Member of the IChemE, a Functional Safety Expert (TÜV Rheinland) and a reputed trainer for Safety Instrumented Systems and Process Hazard & Risk Analysis. Simon is the author of the C&C Technical Support Services PH&RA certificate course and actively contributes to the upgrading of the SIS and Technician courses. Simon is a motivational course leader with a strong reputation for effectively delivering the TÜV Rheinland Functional Safety Training Program globally.

The benefits of selecting C&C for your training needs:

C&C have over 46 years of Oil and Gas related processing experience and all our Functional Safety consultants and their trainers are TÜV Rheinland Functional Safety Experts.

C&C are globally recognised for their Functional Safety expertise and our Engineers have chaired numerous committees and panels associated with this area of engineering. We have been contracted to undertake many Functional Safety Assessments for onshore and offshore related projects for numerous UK based operators.

C&C have been selected as the approved training organisation for the provision of Functional Safety related training by AMEC, BP, ConocoPhillips, EnQuest, Fluor, KPC, Maersk, Petrofac, Petronas, QAPCO, SABIC, TOTAL, Wood Group PSN and many other globally based duty holders. Companies such as BP, ConocoPhillips, Total and Wood Group PSN put all their staff engineers through the C&C FS Engineer training.

C&C is the leading provider of the TÜV Rheinland FS Engineer training program having successfully trained over 1,500 FS Engineers (TÜV Rheinland) for SIS and PH&RA, with a success rate of around 95%.

2017 Registration Form

FS Engineer (TÜV Rheinland) SIS



Participant Details:

Name:
Name of Company:
Postal Address:
.....
.....
.....
Email:
Mobile No:
Wechat ID:

Training Fee:

Fee : **RMB 18,000/ person** (including 5-day training course, material, registration, exam, certificate and lunches during the course, excluding accommodation)

Official VAT invoices can be issued after payment, upon request.

Participants, who fulfill the requirements, attend the complete training and successfully pass the exam will get the FS Engineer (TÜV Rheinland) certificate with an individual ID number.

Method of Payment:

Account Name: Isafe Consulting Co., Ltd. 湖南艾赛弗企业咨询有限公司

Account Number : 6213662173101829726

Bank Name : 华融湘江银行长沙分行

- **Registration Instructions:** Complete the above form, and email to: Info@isafeconsulting.com
- **Hotel Accommodation:** Not included
- **Cancellation Policy:** C&C reserve the right to cancel the course if there are insufficient numbers or due to force majeure. Cancellation of a registered participant up to 28 days before the course attracts an administration charge of 25% of course fee. The full course fee will be payable for cancellations within 10 days of the course start date, and a non-attendance will be considered to be a cancellation. Transfers to an alternative course date will normally be accommodated at no cost, depending on availability and location. Replacement nominations will be accepted at any time before a course.



Course Provider

C & C Technical Support Services Ltd.

Strathayr

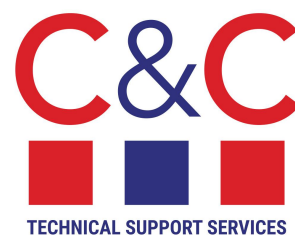
Rhu-Na-Haven Road

Aboyne, AB34 5JB, UK

Email: info@silsupport.com

Phone: +44 (0) 13398 86618

www.silsupport.com



Course Organizer:

ISAFE Consulting Co. Ltd.

2910, #2 Yanggaaangjincheng, Yuhua District,
Changsha, Hunan Province, China

Email: info@isafeconsulting.com

Phone: +86 139 1127 2064

www.isafeconsulting.com

