Functional Safety Engineer (TÜV Rheinland)

Safety Instrumented Systems

Course objective

The objective is to provide instrument engineers, application engineers, site engineers, project managers, operation engineers, maintenance engineers and all those who are involved in the design, realisation, maintenance and operation of safety systems with elementary and necessary knowledge about functional safety, based on the international standards IEC 61508 and IEC 61511.

Course information

Duration: **3.5 days**
- The first three days the training program is conducted both in the morning and afternoon. On the third day afternoon, after the exercises, there is the opportunity to study and ask further questions (optional).
- Fourth day in the morning is the examination – 4 hours (maximum)

Price: **depends on country, please contact us**
- Including course material
- Including fee for examination and certificate
- Including lunch

Participant eligibility requirements: **in accordance with TÜV Rheinland Functional Safety Program**
- A minimum of 3 years experience in the field of functional safety.
- Bachelor degree as a minimum or equivalent engineer level responsibilities, status as certified by the employer.
- Filled out eligibility forms must be sent in two weeks before training date at the latest.

Trainers: **several persons have been recognized by TÜV Rheinland as Trainer in the Yokogawa course program for TÜV Rheinland Functional Safety Engineer**
- Mr. Ton Beems (Yokogawa Europe)
- Mr. Jeff Beijk (Yokogawa Europe)
- Mr. Arjen de Koning (Yokogawa Malaysia)
- Mrs. Elena Mauro (Yokogawa Europe)
- Mr. Ladislav Nagy (Yokogawa Europe)
- Mr. Edison Nishimura Sakamoto (Yokogawa South America)
- Mr. Jin Hyung Park (Yokogawa Korea)
- Mr. Arian Slagt (Yokogawa Europe)
- Mr. S. Vinod (Yokogawa India)
- Mr. Andy Yam (Yokogawa Australia)

Language: **English**
- Alternatively local languages as Dutch, Chinese, Spanish, Portuguese, several Eastern Europe languages, Korean or Hindi can be spoken. In all cases the written material and examination will be in English only.

Training course: **rules**
- Participants will receive training material at start of the training, including hand outs of the PowerPoint presentation and exercise sheets.
- At the end of each training day the applicant will receive the solutions of the group exercises of that day. It may be used for preparing for the examination.

Examination: rules

- Prerequisite to do the examination is that the applicant must attend Yokogawa's training course “TÜV Rheinland Functional Safety Engineer SIS”.
- Pass score is 75%.
- There are 60 multiple (3) choice questions. At the most 2 good answers per question are possible, which is indicated if applicable. The answers will be valued as follows:

good answer	good answer	fault answer	fault answer	no answer	earned points
x	-	-	-	-	1
x	x	-	-	-	2
x	-	x	-	-	0
-	-	x	-	-	0
-	-	x	x	-	0
-	-	-	-	x	0

- There are 7 safety cases. The maximum points to be earned per case are mentioned.
- The examination questions and exercises will be handed over at the start of the examination.
- It is not allowed to bring any documents or (hand held) pc to the exam.
- It is not allowed to take any documents or notices from the exam.
- Check of the examination results will be done by two functional safety experts of Yokogawa.
- Counter check will be done by TÜV Rheinland.
- Discussion about the results is not possible.
- Applicants who succeed will receive their certificate from TÜV Rheinland, which may take some weeks.

Re-examination: for those who did not pass the examination

- Within one year after a failed examination, applicants may sign up once for another examination, free of charge.
- If applicants sign up for attending the training course again, they have to pay full course price.

TÜV Rheinland Certificate: validity and prolongation

The validity of the TÜV Rheinland certificate is 5 years and can be prolonged once. The TÜV Rheinland FS Engineer will receive a unique ID-Number consisting of a serial number followed by the year of certificate issue. Example: 21573 / 19.
Prolongation of the TÜV Rheinland FS Engineer certificate will be effected as follows:

- TÜV Rheinland will send an e-mail to all TÜV Rheinland FS Engineers whose certificate will expire, by end of the year preceding the expiration date.
- The TÜV Rheinland FS Engineer has to fill in a form and send an official letter from his/her employer or from a customer to TÜV Rheinland, in which his/her current and continuous work in the specified area of the certification (in this case Safety Instrumented Systems) is described and/or confirmed.
- The TÜV Rheinland FS Engineer has to forward a paper (2-3 pages) to TÜV Rheinland describing projects he/she has carried out during the last 5 years of his/her professional life describing his/her experience in functional safety.

- The costs for the new TÜV Rheinland FS Engineer certificate are Euro 500. Only after the TÜV Rheinland FS Engineer has paid the costs to TÜV Rheinland the new TÜV Rheinland FS Engineer certificate will be issued.
- The new TÜV Rheinland FS Engineer certificate will be valid for another 5 years and will contain the same unique ID-Number as issued with the initial certification. Example: 21573 / 19.

TÜV Rheinland Certificate: **after 10 years**

- After another 5 years (in total 10 years after the initial training) the prolonged certificate expires. To remain TÜV Rheinland FS Engineer one again has to sign up for the (re)training and exam. The reason is that in a period of 10 years both IEC61508 as well as IEC61511 are expected to be updated and functional safety knowledge may have faded. Hence to maintain your proven competency you are invited to join the training again. You will keep your initial unique TÜV Rheinland FS Engineer SIS number, however the year of certificate issue will be updated to the year of retraining. Example: "old" 1st ID-Number: 21573 / 19
  "new" 2nd ID-Number: 21573 / 29
- TÜV Rheinland FS Engineers who do not wish the prolongation of their certificate will be listed on the TÜV Rheinland website with the indication that their certificate is no longer valid.

Location: **at various Yokogawa premises world wide**

- Alternatively in house trainings at customer premises can be organized in which case special conditions apply.

Schedule: **locations and dates will be published on the TÜV Rheinland website (tuvasi.com)**

- Also available on Yokogawa website.
- Registration for attending the training will be closed two weeks before training date.

Contact: **Safety Assurance and Consultancy group**

- Safety.Assessments@nl.yokogawa.com

Course agenda overview

Day 1: **morning**

General Introduction

Module 1: Introduction to Functional Safety
- What is safety?
- Why safety?
- What is a safety system?
- Position of SIS in the total equipment under control

Module 2: International safety standards IEC 61508 and 61511
- The six main pillars of the standards

Day 1: **afternoon**

Module 3: HAZOP - SIF - SIL
- Hazard and risk assessment
- Determine Safety Instrumented Functions (SIF)
- Determine Safety Integrity Levels (SIL)
- Group exercises

Day 2: morning

Module 4: Safety Engineering
- De-energize To Safe state (DTS)
- Energize To Safe state (ETS)
- Redundancy
- Safety architectures
- Reliability modeling (Reliability Block Diagram – RBD)
- Group exercise on RBD
- Sensor validation
- Overrides, by-passes, inhibits
- Process safety time and system response time
- Logic Solver architectures

Day 2: afternoon

Module 5: Functional Safety Management
- Implications for organizations involved throughout the safety life cycle

Module 6: Failures and Hardware Fault Tolerance
- Random hardware failures and their modes
- Failure mode effect analysis
- Safe Failure Fraction (SFF)
- Hardware Fault Tolerance (HFT)
- Group exercise on HFT

Day 3: morning

Module 7: Common cause influences and other failure types
- The beta factor
- Systematic failures
- Human Failures

Module 8: Safety calculations
- Safety parameters
- Formulas
- Proof testing
- Group exercises on PFD_{AVG} calculations

Day 3: afternoon

Exercises

Optional session for your questions
- Self study and Questions

Day 4: morning

Examination
- 60 Multiple choice questions
- 7 Cases
- Those who have finished may leave earlier