This vocational qualification training of the **TÜV Rheinland Functional Safety Program** supports engineers (and/or persons working in functional safety business) to deepen their knowledge and their experience in order to achieve a worldwide acknowledged know how and practical experience within the area of functional safety according to the IEC 61508 international standard, ISO 13849 and IEC 62061.

Engineers who are working in the field of functional safety for many years have the possibility to obtain an official verification of their expertise. By passing a final exam successfully they will receive a Functional Safety Engineer (TÜV Rheinland) certificate.

The new standards regarding Functional Safety as well as the new European Machinery Directive demand that persons and organisations performing responsible (accountable) tasks during the life cycle phase of a machine have to acquire and prove their competencies in Machine Safety.

Within this training the requirements for the design as well as the proof of Functional Safety for Machinery applications are described and discussed in detail based on the relevant current standards.
The selection of protective devices for Machinery in order to achieve the required risk reduction is shown. Examples of safety functions are explained. The main requirements of ISO 13849 and IEC 62061 for the design of safety related parts of machine control systems are presented and appliction examples illustrating the quantitative assessment of safety functions are discussed.

Agenda.

Day 1

Introduction „TÜV Rheinland Functional Safety Program“

Guidelines and Standards
Machine Directive, A, B and C standards,
Standards and status of standards regarding Functional Safety in Machine safeguarding,
Importance (meaning) of harmonized and non-harmonized standards
Machines and safety components listed in the appendix IV of the Machinery Directive.

Risk Analysis
Methods for determination of necessary measures for the reduction of risks at machines (ISIO 12100);
Direct, indirect and indicative safety;
Procedure acc. to ISO 13849 and EN 62061,
Examples;
Comparison of safety classifications.

Introduction to ISO 13849
Importance (meaning) of safety categories;
Principle information regarding deterministic fault consideration, faults and fault exclusions acc. to ISO 13849-2;

Safety Devices
Systematic of safety devices, advantages and disadvantages, installation requirements, configuration of safety devices;

Guards, interlocking devices:
- Types, examples regarding application, installation requirements acc. to different safety categories
- Faults, fault exclusions
- Normative requirements

Other safety devices:
- Type, installation requirements, advantages and disadvantages;
- Calculation of safety distances

Day 2

Safety functions of machines
Start/re-start interlock, start functions,
Emergency off, emergency switching off, stop categories muting etc. ,
Realization acc. to the different safety categories

Circuits, schematics, examples
Connection of safety devices to controls, interface circuits
Realization acc. to the different safety categories,
Examples for correct and incorrect typical circuits.

New standards regarding safety of machinery
Importance (meaning) of these standards regarding quality management, documentation and safety related availability.

Day 3

ISO 13849
Contents of ISO 13849-1, application area, restrictions regarding applicability,
Documentation requirements and quality management,
Requirements regarding SW,
Use of standard components in safety functions,
Proof of safety, verification and validation of safety functions,
Examples.

Validation
Validation acc. to ISO 13849-2.

IEC 62061
Content of IEC 62061, application area,
Documentation requirements and quality management, life cycle model,
Meaning of terms SIL, SIL CL, HFT, SFF and their context,
Requirements regarding safety relevant application software,
Proof of safety, verification and validation of safety functions,
Examples.

Day 4

Examples
Examples for proof of Functional Safety acc. to IEC 62061,
Examples for proof of Functional Safety acc. to ISO 13849-1
Questions and answers, discussion.

Day 5

Exam

Further Information.

Target Group

Application engineers and system integrators with some experience in Functional Safety; also designers and safety specialists working in Machinery applications.

Entry Requirements

This training is designed to provide benefit for engineers with some experience in Functional Safety. It is highly recommended that participants either have experience in Safety of Machinery applications or have attended an introduction course on Functional Safety.

Working Material

The standards ISO 13849 part 1 and part 2 and IEC 62061 are required working material for this training and need to be brought along by the participants.

Duration of Training

5 days.

Start:	9 a.m.
End:	approx. 5 p.m.

Cost

US $ 4,000

Includes: exam, training proceedings, lunch and refreshments.

Exam

The exam will take place on the last day, Day 5, of the training.

Duration:	approx. 3-4 hours
Start:	9.30 a.m.
End:	approx. 1 – 2 p.m.

The exam consists of 70 multiple choice questions and 12 open questions.

The standards EN ISO 13849 part 1 and 2 and EN 62061 are essential working material for the exam. Additionally a calculator should be brought along for the quantitative assessment.

FS Engineer (TÜV Rheinland) Certificate

Participants who wish to obtain the „**FS Engineer (TÜV Rheinland)**“ certificate have to attend the complete training and pass the exam as well as have to fulfil the following requirements:

1. a minimum of **3 years experienc**e in the field of functional safety.
2. University degree (Master's or Bachelor's degree in Engineering)

or

Equivalent engineer level responsibilities status certified by employer.

All FS Engineers (TÜV Rheinland) are listed on the website of TÜV Rheinland for Functional Safety www.tuvasi.com.

Attendants who do not wish to attend the exam and do not wish to obtain the certificate, do not have to fulfil any requirements.

Information / Registration
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