



Choose certainty.  
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# CERTIFICATE

**Heli Herranen**

Has successfully completed the Functional Safety  
Certification Program requirements for

***Functional Safety Engineer***

In accordance with  
IEC 61511:2016

Date issued: 31-August-2023  
ID number: TP23051830  
Field: Process Industry  
Subject: Safety Instrumented Systems

A blue ink signature of G. Greil, consisting of stylized cursive letters.

G. Greil  
Certifier

A blue ink signature of Dr. Michel Houtermans, featuring a more complex, flowing cursive script.

Dr. Michel Houtermans  
Trainer

# CURRICULUM

- **Functional safety management:**  
Life cycle concept, documentation requirements, verification, validation, assessments and audits, modifications
- **Hazard & Risk Analysis:**  
Hazard identification, hazard analysis, risk reduction, safety function definition using FTA, HAZOP, LOPA, Risk matrix, risk graph
- **Planning the safety system:**  
Planning for end users, integrators, and realization of safety systems, safety plan, verification plan, validation plan, safety requirement specification, requirements for suppliers, FAT, SAT
- **Hardware design:**  
Hardware lifecycle, energize vs de-energize, low demand, high demand, demand mode, continuous mode, redundancy, diversity, voting, hardware fault tolerance, safe failure fraction, type A/B, architectural constraints, proof testing, diagnostic tests, measures to avoid and control failures
- **Hardware reliability:**  
Reliability modeling, FMEDA, simplified equations, block diagrams, FTA, Markov, failure data, HFT, SFF, DC, CCF, SIL, PFH, PFD
- **Software design:**  
Software lifecycle, embedded software, application software, utility software, fixed programming languages, limited variability languages, full variability languages, software architecture, V-model, measures to avoid failures
- **Operation and maintenance:**  
Installation and commissioning, safety validation, operation, maintenance and repair, modification and retrofit, maintenance override
- **Experience:**  
The holder of this certificate has more than 6 years experience in more than 2 functional safety projects