



Training Days

TITLE:
Safety Instrumented Systems (SIS)

DATA:
21 September

TEACHER:
Professor Alessandro Brunelli

ABSTRACT:

The course explains the first the general requirements of the IEC 61508, and then outlines the requirements of the functional safety of the process industry IEC 61511, which describes the requirements necessary to ensure the functional safety of industrial plants.

The course then examines in completion the procedures, methodologies and examples of application necessary to ensure the functional safety in the process industry, through Electrical, Electronic and Programmable Electronic Systems (E/E/PES) and other systems of other technology (safety valves, exhaust valves, rupture discs, etc.) designated to reduce the consequences of the potential risks.

The course then brings practical criteria for the interpretation and implementation of the specific requirements of the IEC 61511, outlining case studies of the life cycle in the safety of industrial plants, the different methodologies used in the process hazard and risks analysis (PRA, ALARP, HAZOP, etc.), the correct determination of safety integrity levels (SIL) for the safety instrumented systems (SIS), through various approaches and practical graphs and risk matrices, presenting finally practical example, from detailed risk analysis to engineering and verifying the required SIL with program dedicated.

TARGET:

The course is for all interested operators to functional safety, i.e. designers, integrators, installers, inspectors, auditors and maintenance workers to run and operation of industrial plants.

MAIN ARGUMENTS:

• **Overall structure of reference international standards:**

- IEC 61508: Functional safety of electrical/electronic/programmable and safety-related systems
- IEC 61511: Functional safety – Safety instrumented systems for the process industry sector

• **The key point of IEC 61511:**

- From the process hazard and risk analysis to the:
- Allocation of safety instrumented function (SIF),
- Specification of Safety Instrumented Systems (SIS),
- Design and engineering of the SIS,
- Installation and validation of the safety of the SIS,
- Operation; modification and maintenance of the SIS

• **Examples of calculations and checks:**

- Practical calculation of the Safety Integrity Level (SIL)
- Check the designed and engineered SIL
- Periodic Testing & Time Interval (TI) to maintain the required SIL
- Partial Stroke Testing (PST) and Proof Test Coverage (PTC) to improve practical SIL

• **Methods of risk analysis**

- Process Risk Analysis (PRA)
- HAZard OPerability study (HAZOP)
- Tree Technical Analysis Method (TREE)
- As Low As Reasonably Applicable (ALARP)

• **Practical examples of the determination of the SIL**

- Pressure Process
- Tank Pressure

TEACHING MATERIALS:

About 300 slides for the lessons and an application program distributed to each participant for the determination, calculation, verification, evaluation and exemplification of the SIL in the practical examples.

REFERENCE BOOK

Sicurezza funzionale degli impianti industriali – A. Brunelli, F. Andreolli – Editoriale Delfino - ITALY
[SICUREZZA FUNZIONALE DEGLI IMPIANTI INDUSTRIALI | Editoriale Delfino](#)

FINAL CERTIFICATION:

AIS_ISA Certificate of Participation in the Course

To participate contact us at: summit@aisisa.it – 0039 02 54123816

PROFESSOR PROFILE:



Alessandro Brunelli is Graduated Technologist at the Higher Institute of Industrial Technology Mechanical of the Polytechnic of Milan in 1974, which operated in the field of training and certification of industrial instrumentation for over thirty-five years at an Experimental Laboratory and was then Professor in the Course of Mechanical and Thermal Measurement of the Polytechnic of Milan and now for ten years Consultant and Teacher in Measurement and Control Instrumentation

Participates in the activities of National, European and International standardization for mechanical and electronic equipment, and in this matter, he is Responsible of the Commission UNI (Italian National Unification) on "Metrology of Pressure and Temperature" and is Secretary of the Technical Committee CEI (Italian Electrotechnical Committee) on "Industrial-Processes Measurement, Control and Automation".

During his career he published many paper in the field of measurement and automation of industrial process, has published two monographs relating the "Humidity Measurement" and the "Flow Measurement", has also published a series of five volumes on the "Measurement and Control in Industrial Applications" and a specific volume on "Industrial Measurements: Physical & Mechanical".

Recently has published two volumes of an "Instrumentation Measurement and Control Handbook", one "Calibration Handbook of Measuring Instruments", and two volumes regarding Instrumentation Safety Aspects relating to the "Safety Instrumented Systems SIS" and to the "Fire & Gas Systems FGS".