Instrumentation Design Engineering: Instrument Index, Datasheets, Loop Diagrams and Hook-Ups

27 September – 1 October 2027
Paris - Right Bank business hotel



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Introduction:

Instrumentation design errors surface late and cost most at site: a tag missing from the instrument index, a datasheet with the wrong wetted material, a loop diagram that disagrees with the junction box terminals or a hook-up that cannot be installed. This Core Concept course gives instrument engineers and designers a deliverable-by-deliverable method for instrumentation design, from P&ID tagging to vendor document review. Participants assemble an Instrumentation Design Package with an instrument index, datasheet, loop diagram and hook-up set for a case process unit.

Course Objectives:

- Plan instrumentation design deliverables and their sequence from P&ID issue to construction drawings
- Tag and populate an instrument index from P&IDs using ANSI/ISA S5.1 identification letters and loop numbers
- Specify flow, level, pressure and temperature instruments on datasheets with process data, ranges, materials and connections
- Produce hook-up drawings, loop diagrams, junction box and marshalling layouts and cable schedules that agree with each other
- Apply hazardous area classification, protection concepts, instrument power and earthing rules to field device and cabinet design
- Check I/O lists, interface documents and vendor submittals in structured design reviews

Target Audience:

- Instrument engineers who prepare datasheets, specifications and indexes for new projects and brownfield modifications
- Instrument designers and draughting staff who produce hook-ups, loop drawings and junction box layouts
- Facilities and plant I&C staff who review design packages before installation and keep as-built records
- Project engineers who coordinate instrument deliverables with process, piping and electrical disciplines
- Commissioning and construction engineers who rely on loop drawings and cable schedules to install and check instruments

Course Outline:

Day 1: Instrumentation Design Workflow, P&IDs and Instrument Tagging

- Instrumentation Deliverables List: Index, Datasheets, Hook-Ups, Loop Drawings and Cable Schedules
- Design Phase Sequence from Front-End Definition to Issued-for-Construction Drawings
- P&ID Instrument Bubbles, Line Symbols and Signal Types per ISO 14617-6 Conventions
- ANSI/ISA S5.1 Identification Letters, Succeeding Letters and Loop Number Allocation
- Tag Register Audit: Finding Missing, Duplicate and Mismatched Tags on Case P&IDs

Day 2: Instrument Index, Datasheets and Design-View Instrument Selection

- Instrument Index Columns: Service, Line Number, Range, Signal, Location and Status Fields
- Instrument Datasheet Structure: Process Conditions, Wetted Materials, Connections and Options
- Flowmeter Selection Matrix by Fluid, Turndown, Straight Run and Pressure Loss
- Level, Pressure and Temperature Transmitter Selection with Range and Thermowell Data
- Instrument Specification Requisition and Technical Bid Evaluation Table

Day 3: Hook-Up Drawings, Loop Diagrams and Field Wiring Design

- Process Hook-Up Drawings: Impulse Tubing, Manifolds, Slope and Bill of Materials
- Pneumatic and Mounting Hook-Ups with Instrument Air Supply Details
- Loop Diagram Content: Field Device, Junction Box, Marshalling and Control System Terminals
- 4-20 mA, HART, Foundation Fieldbus and Profibus Wiring Conventions on Loop Drawings
- Junction Box Terminal Allocation, Spare Philosophy and Multicore Cable Assignment

Day 4: Cabling, Power, Earthing, Hazardous Areas and System Interfaces

- Cable Schedule and Tray Routing Layout with Segregation of Signal Levels
- Instrument Power Distribution, UPS Loads and Cabinet Heat Dissipation Checks
- Instrument Earthing and Screen Termination Scheme for Clean and Safety Earths
- Hazardous Area Zone Drawings per IEC 60079-10-1 and Ex d, Ex e, Ex i and Ex p Selection
- I/O List, Marshalling Cabinet Layout and Control System Interface Document

Day 5: Design Review Case and the Instrumentation Design Package

- Case Process Unit Brief: Separator, Pump and Heater P&IDs with Process Data
- Case Build: Instrument Index and Datasheet for the Unit's Key Measurements
- Case Build: Loop Diagram and Hook-Up Set for Selected Flow and Level Loops
- Vendor Document Review Checklist and Comment Resolution Sheet
- Instrumentation Design Package Presentation and Cross-Discipline Design Review

Skills You Will Gain:

- Instrument Tagging
- Instrument Index Management
- Datasheet Specification
- Hook-Up Drafting
- Loop Drawing Preparation
- Cable Schedule Development
- Hazardous Area Instrument Selection
- Vendor Document Review

Why Attend This Course:

- Leave with an Instrumentation Design Package covering an instrument index, datasheet, loop diagram and hook-up set for a case process unit
- Catch tag, range and terminal mismatches between drawings before they reach construction
- Answer vendor and client review comments with checklists instead of redrawing late
- Compare design practice with instrument peers from oil and gas, petrochemicals, power, water and utilities projects

Conclusion:

Instrumentation design holds together when every tag, datasheet, hook-up, loop drawing and cable entry tells the same story. The course moves from deliverables, P&ID symbols and ANSI/ISA S5.1 tagging, through the instrument index, datasheets and design-view selection, to hook-ups, loop diagrams and wiring, then cabling, power, earthing, hazardous areas and I/O interfaces. The final day produces an Instrumentation Design Package that participants can use as a checking template on their next project.