Smart Instrument Commissioning Training Course: HART, Fieldbus, Loop Checks

7 – 11 December 2026
Madrid

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Programme Summary

Smart instrument commissioning is the subject of this one-week training course for instrumentation and control engineers, commissioning leads and maintenance managers, taught at applied level and ending in an instrument handover file for one process unit. Transmitters, valve positioners and analysers now carry software settings and diagnostics, yet startup often proceeds with undocumented ranges and untested loops. The programme moves from device communication to configuration, loop checks, diagnostics and handover, using prepared records from a refinery and a water treatment plant. Mars Training Centre UK delivers this programme on smart instrument commissioning to mixed-organisation cohorts.

The Business Case

Plants that configure instruments to a recorded standard and prove each loop before startup avoid trips, false alarms and weeks of troubleshooting. Where settings are entered from memory and loops are checked only for continuity, wrong ranges and failed feedback remain hidden until production is at risk. Without configuration baselines, later device swaps repeat the same faults. The programme works on the measures below.

- Startup Delay: Shortens when loops are tested against a written procedure and deviations are closed.
- Nuisance Alarms and Trips: Fall when ranges, damping and failure modes are set deliberately.
- Maintenance Effort: Reduces when device records let a replacement be configured quickly.

Principles and Evidence Base

- IEC 61158: The international series on industrial communication networks and fieldbus specifications, applied in Session 1 to read segment and device layouts.
- IEC 61511: The functional safety standard for the process industry, applied in Session 4 to link proof test records to device settings.

Intended Participants

- Instrumentation engineers who configure and calibrate field devices.
- Commissioning leads who prove loops and clear punch lists before startup.
- Maintenance managers who keep device records and spares under control.
- Control system engineers who bring device data into the control system.

Typical settings include refineries, chemical plants, power stations and water treatment facilities.

Learning Outcomes

1. Participants will be able to construct a configuration sheet for a transmitter, positioner or analyser.
2. Participants will be able to evaluate damping and range settings against process response needs.
3. Participants will be able to diagnose loop faults from test records and device diagnostics.
4. Participants will be able to prioritise commissioning deviations by effect on safe startup.
5. Participants will be able to justify a change control procedure for smart instrument settings.

Programme Structure

Day 1: Smart Instrument Architecture and Communication

How does a smart instrument measure, process and report, and over which link?

- Smart Transmitter Signal Path Diagram
- HART Communication Layer Review
- IEC 61158 Fieldbus Segment Map
- Device Description File Register
- Instrument Index Reconciliation

Day 2: Device Configuration, Ranges and Damping

How are ranges, units and damping set so the output reflects the process?

- Range and Span Setting Sheet
- Damping and Response Time Trade-Off
- Valve Positioner Setup Checklist
- Analyser Output Scaling Table
- Failure Mode and Alarm Level Settings

Day 3: Loop Checks and Instrument Testing

How is each loop proved from field device to control system before startup?

- Loop Check Procedure
- Calibration Point Record
- Simulated Signal Injection Method
- Valve Stroke and Feedback Test
- Punch List and Deviation Log

Day 4: Device Diagnostics, Records and Change Control

What do device diagnostics reveal, and how are configuration changes controlled?

- Device Diagnostic Status Review
- Configuration Baseline Record
- Change Request and Approval Form
- IEC 61511 Proof Test Record Link
- Spare Device Configuration Plan

Day 5: Smart Instrument Handover for One Unit

Do the earlier records join into a handover file a plant can operate from?

- Applying the Session 2 Setting Sheet
- Testing the Session 3 Loop Records
- Checking the Session 4 Baseline Record
- Reviewing the Open Deviation Log
- Completing the Instrument Handover File

Methodology

The programme is a data workshop built on prepared records from a refinery and a water treatment plant: instrument indexes, device description listings, calibration sheets, loop diagrams and diagnostic logs. Participants prepare settings, plan loop checks, read diagnostic data and defend their findings to peers acting as a startup review team.

- Suggested activity: Setting a range and damping value from a process data sheet.
- Suggested activity: Planning a loop check for a control valve with feedback.
- Suggested activity: Reading a diagnostic log to decide whether a device needs replacement.

Capstone Output

Each participant completes an instrument handover file for one process unit. It holds configuration sheets, loop check records, a baseline register, a change control form and a deviation log. At work it goes to the startup review team for acceptance and becomes the reference for later device replacement.

Frequently Asked Questions

Is smart instrument commissioning training suitable for engineers new to HART devices?

Yes. Smart instrument commissioning is taught from prepared records and templates. You need basic knowledge of process measurement and control loops, but no experience with a particular device make.

Which standards does smart instrument commissioning rest on in this training?

Smart instrument commissioning here rests on IEC 61158 for fieldbus communication and IEC 61511 for functional safety records, with HART used as the worked communication example.

How is the handover file from smart instrument commissioning training used at work?

You take the instrument handover file to your startup review team, use its loop records as acceptance evidence and apply its change form to later settings edits.

How does smart instrument commissioning differ from control loop tuning?

Smart instrument commissioning covers configuring and proving field devices and their records, while control loop tuning adjusts controller parameters after the instruments are known to be correct.