



شركة ميرك العربية السعودية
MEIRC Saudi Arabia

Principles Of Distributed Control Systems (DCS)

Duration: 5 Days

Course Overview:

Flow measurement is essential in the daily processing or operating in many industries such as the oil, power, chemical, food, water, and waste treatment industries. This comprehensive training course is designed in accordance with the Instrument Society of America. (ISA). The course will provide the trainees with the required qualifications to calibrate pressure, differential pressure, temperature, flow, and level instruments. The quantity to be determined may be volume flow rate, mass flow rate and flow velocity or other quantities derived from these. The course is designed to be highly interactive to enable the trainees to benefit from the experience of the other participants and the presenters. There will be a number of hands-on exercises, theoretical examples and exercises during the course and time is also included to give the participants an opportunity to discuss specific problems.

Who Should Attend?

This course is designed for instrument technicians and electricians as well as for the multi-craft training needs of process and manufacturing facilities.

1. [Calibration Principles](#)
2. [Calibrating Pressure and Differential Press. Instruments](#)
3. [Calibrating Temperature Instruments](#)
4. [Calibrating Flow Instruments](#)
5. [Calibrating Level Instruments](#)

Course Outlines:

Module One: Calibration Principles

Description: This module introduces basic concepts of instrument calibration. The module explains the characteristics of proper instrument performance as well as how to identify common instrument errors. In addition, the steps in a typical calibration procedure are demonstrated.

Objectives:

- Define calibration
- Recognize if an instrument is properly calibrated by examining the instrument input and output
- Explain how calibration affects quality, productivity, and safety
- Identify conditions when calibration is performed such as at an installation, periodic scheduled maintenance, in response to process deviation, and after repair or change in mounting position
- Recognize accuracy and precision
- Identify zero shift, span error, combined zero shift and span error, and non-linearity with a pattern of instrument readings on an input/output graph or calibration data sheet
- Identify the basic elements of a calibration set-up
- Identify the input values for a five point
- Calibration check as a percent of the instrument's range

Module Two: Calibrating Pressure and Differential Press. Instruments

Description: This module demonstrates the necessary steps for calibrating pressure instruments. The module also identifies procedures and set-up equipment for pressure calibration. Emphasis is placed on selection of the appropriate test instruments and interpretation of readings.



Objectives:

- Set up a pressure transmitter, differential pressure transmitter, and a pressure gage for calibration with the appropriate input and output test equipment, proper connections, and mountings
- Perform a five-point calibration check on an analog electronic pressure transmitter, a differential pressure transmitter, and a pressure gage
- Identify zero shift, span error, combined error, and nonlinearity
- Properly adjust pressure instruments to eliminate errors
- Use a digital interface device to re-range a smart pressure transmitter

Module Three: Calibrating Temperature Instruments

Prerequisites: This module is designed for participants familiar with the basic principles of calibration including calibration procedures, common instrument errors, and the standards for instrument performance. An understanding of algebra is also recommended.

Description: This module teaches basic procedures for checking the calibration of thermocouples and RTDS, as well as for calibrating temperature instruments including thermocouple transmitters and RTD transmitters. Procedures using thermocouple and RTD tables are presented in addition to calibration steps using a digital temperature calibrator.

Objectives:

- Identify common test equipment used as measurement standards for calibration of temperature instruments
- Property set up and connect the measurement standards for calibration of temperature instruments
- Identify the proper thermocouple or RTD table for the sensor in the loop and use the tables in calibration
- Check the calibration of thermocouples and RTDs
- Calibrate an analog electronic temperature transmitter whose input is provided by a thermocouple or an RTD
- State safety precautions for calibrating temperature instruments in the field

Module Four: Calibrating Water Flow Instruments (Gravimetric, Volumetric and Master Meter Method) Calibration

Description: This module demonstrates procedures for calibration of flow instruments. The module specifically explains calibration of mechanical, differential pressure transmitters, magnetic flowmeters, vortex shedding flowmeters, and mass flowmeters. Emphasis is placed on the proper set-up for calibration and the selection of the proper test equipment.

Objectives:

- Observe the correlation between differential pressure and flow rate
- Identify and set up the measurement standards for calibrating a differential pressure transmitter
- Perform a five point check on a differential pressure transmitter
- Interpret the results and correct instrument errors
- Set up a square root extractor for calibration and adjust its zero
- Observe how a magnetic flowmeter generates the output voltage as a result of the input voltage
- Calibrate a mechanical flowmeter
- Calibrate a magnetic flowmeter
- Observe how a vortex shedding flowmeter generates output resulting from input
- Set the course span jumpers correctly and determine proper calibration of a vortex shedding flowmeter
- Connect the interface device to the smart mass flowmeter
- Set the interface device to the smart mass flowmeter
- Modify the upper and lower range values



- Download the new information to the transmitter
- And test the mass flowmeter for autozero

Module Five: Calibrating Oil, Petrol and Diesel Flow (Gravimetric, Volumetric and Master Meter Method) Instruments

Description: This module demonstrates procedures for Calibration of flow with liquids other than water include calibration, verification and counselling on flow measurement with meters and measuring systems for liquids other than water, including oil, petrol and diesel.

Objectives:

- Calibrate of orifice, turbine, ultrasonic, venture, Electro-Magnetic, Vortex
- Connect the interface device to the smart mass flowmeter
- Set the interface device to the smart mass flowmeter
- Modify the upper and lower range values
- Download the new information to the transmitter

Module Six: Calibrating Level Instruments

Description: This module demonstrates the steps for calibrating level instruments. Specifically, the module shows set-up procedures for Electronic Level Gauge which uses Guided Pulse Method, differential pressure transmitters and electronic displacement level transmitters in a variety of applications.

Objectives:

- Identify the importance of properly calibrated level instruments
- Describe how hydrostatic pressure can be used to sense liquid level
- Determine the input range for calibrating a differential pressure transmitter for use in a specific level application
- Calibrating of Electronic Level Gauge which uses Guided Pulse Method
- Select the input and output measurement standards for calibrating hydrostatic level instruments
- Calibrate a differential pressure transmitter used in an open tank or dip pipe, a closed tank with dry leg, and closed tank with wet leg
- Define elevated or suppressed zero and determine the amount of zero suppression or elevation in a given hydrostatic pressure level gaging system
- Describe how an electronic displacement level transmitter uses buoyant force to sense liquid level
- Select the input standards for calibrating an electronic displacement level transmitter for liquid-vapor and liquid-liquid interface applications
- Select the output equipment for calibrating an electronic displacement transmitter
- Calibrate an electronic displacement level transmitter for liquid-vapor and liquid-liquid interface applications