

# ISA CERTIFIED CONTROL SYSTEMS TECHNICIAN® CLASSIFICATION SYSTEM

## DOMAIN I: CALIBRATION

### 1. Obtain all documents needed for device calibration in order to proceed with calibration.

**Knowledge of:**

Calibration sheets

Data sheets

Loop sheets

Mechanical and electrical drawings

P&ID drawings

Site procedures

**Skill in:**

Communication

Following site procedures

Interpreting drawings

Searching technical information

### 2. Identify the correct device to be calibrated through documentation and instrument identification systems in order to ensure proper calibration.

**Knowledge of:**

ISA standards

Site documentation

**Skill in:**

Converting unit from metric/English or English/metric

Interpreting data sheets

### 3. Select the correct test equipment through documentation and visual inspection as identified by site calibration procedures in order to correctly calibrate the device.

**Knowledge of:**

Acceptable certifying agencies, companies, etc.

All appropriate procedures

Basic measurement units

Electrical and pneumatic test equipment

ISA standards on calibration of test equipment

**Skill in:**

Obtaining appropriate test equipment

Using hand tools

Using test equipment

Validating certification by matching or locating certification stickers

**4. Connect the test equipment to the device as required by manufacturer specifications and site procedures in order to properly and safely calibrate the device.**

**Knowledge of:**

- All appropriate site procedures
- Basic conversions
- Basic flow units
- Basic level
- Basic physical and chemical properties of matter
- Basic physics of energy and power
- Basic pressure units
- Basic temperature scales
- Fundamentals of electricity
- Fundamentals of pneumatics
- Fundamentals of schematic diagrams
- Manufacturer specifications

**Skill in:**

- Building a mechanical and electrical circuit, including piping, wiring circuits, and working with live circuits using test equipment
- Using hand tools
- Using power sources
- Using pressure sources
- Using test equipment

**5. Apply input values to the device as specified on instrument data sheet in order to simulate process parameters.**

**Knowledge of:**

- Basic conversions and mathematics
- Basic flow units
- Basic level
- Basic physical and chemical properties of matter
- Basic physics of energy and power
- Basic pressure units
- Basic temperature scales
- Fundamentals of electricity
- Fundamentals of pneumatics
- Fundamentals of schematic diagrams
- Manufacturers specifications

**Skill in:**

- Simulating a mechanical/pneumatic/electrical signal into a device
- Using hand tools
- Using power sources
- Using pressure sources
- Using test equipment
- Using/working with high pressure sources, high temperature sources, voltage and current sources, etc.

<b>6. Record “as found” readings on calibration sheets in order to provide a history of the device.</b>
<b>Knowledge of:</b>
Conversions
Electronic fundamentals
Mathematics
Physical sciences
Pneumatic fundamentals
<b>Skill in:</b>
Applying mathematical units and relationships
Gathering technical information
Selecting required form
Writing
<b>7. Compare “as found” readings with the required values as specified by the instrument data sheet in order to identify if the device needs to be adjusted according to allowable tolerances.</b>
<b>Knowledge of:</b>
Conversions
Electronic fundamentals
Mathematics
Physical sciences
Pneumatic fundamentals
<b>Skill in:</b>
Analyzing data
Applying mathematical units and relationships
Selecting required forms
Writing
<b>8. Make adjustments to the device, if necessary, through site calibration procedures in order to ensure accuracy.</b>
<b>Knowledge of:</b>
Calibration procedures
Electrical fundamentals
Electronic fundamentals
Mathematics
Physical sciences
Pneumatic fundamentals
<b>Skill in:</b>
Analyzing data
Reading and interpreting test equipment
Using power sources (electrical or pressure)
Working with tools

**9. Complete all documentation as required in order to update all calibration records.**

**Knowledge of:**

Calibration procedures

Electrical fundamentals

Electronic fundamentals

Mathematics

Physical sciences

Pneumatic fundamentals

Site documentation procedures

**Skill in:**

Applying mathematical units and relationships

Completing calibration sheets

Gathering technical information

Selecting required forms

Writing

## DOMAIN II: LOOP CHECKING

- 1. Obtain documents pertaining to the process loop in order to understand all devices and their intended functions.**

**Knowledge of:**

ISA loop diagrams as per ISA standards  
ISA symbol and terminology as per ISA Standards 5.1  
Loop checking procedures  
The function of each loop component

**Skill in:**

Following all appropriate procedures  
Interpreting loop diagrams  
Interpreting P&ID symbols

- 2. Inspect the loop components through visual observation in order to ensure that the components are correctly installed.**

**Knowledge of:**

ISA loop diagrams as per ISA standards  
Loop components and operations through review of data sheets  
Mechanical & electrical fundamentals

**Skill in:**

Following all appropriate procedures  
Interconnecting loop components  
Interpreting loop diagrams  
Interpreting P&IDs

- 3. Verify that appropriate utilities are available and operational through visual inspection in order to perform the loop check.**

**Knowledge of:**

DC & AC circuits  
Mechanical and electrical fundamentals  
Physical sciences and mathematics

**Skill in:**

Interpreting mechanical and electrical drawings  
Interpreting P&IDs  
Using test/measurement equipment

- 4. Isolate the process loop from the system by following established site procedures in order to perform the loop check in a safe manner.**

**Knowledge of:**

Loop diagrams  
P&IDs  
Site loop check procedures  
Site safety procedures

**Skill in:**

Following all appropriate procedures  
Interpreting P&IDs  
Using loop diagrams

<b>5. Simulate a change in the measured variable in order to verify proper loop performance.</b>
<b>Knowledge of:</b>
Basic physical properties of matter
Basic temperature, pressure, flow, and level properties
Function of each loop component
Fundamentals of electricity
<b>Skill in:</b>
Interpreting loop diagrams
Interpreting P&IDs
Using hand tools
Using test equipment
Using test equipment
<b>6. Make necessary corrections in order to bring loop performance within specifications.</b>
<b>Knowledge of:</b>
Basic physical properties of matter
Basic temperature, pressure, flow, and level properties
Function of each loop component
Fundamentals of electricity
<b>Skill in:</b>
Interpreting loop diagrams
Interpreting P&IDs
Interpreting specification sheets
Using hand tools
Using test equipment
<b>7. Complete all documentation as required in order to update all loop records.</b>
<b>Knowledge of:</b>
All appropriate site documentation
All appropriate site procedures
ISA loop diagrams and ISA loop standards
<b>Skill in:</b>
Technical writing
Using drafting standards

**DOMAIN III: TROUBLESHOOTING**

**1. Examine all pertinent documentation in order to identify the proper operation of the control system and devices and to provide a baseline against which to evaluate the problem.**

**Knowledge of:**

Final elements

Front end elements

Loop sheets

Operating manuals and procedures

P&amp;ID drawings

Process control system

Site procedures

Systems

**Skill in:**

Interpreting a loop drawing to identify the devices in a particular loop

Interpreting complex technical documents

Interpreting P&amp;IDs

Understanding process control

**2. Identify any discrepancies between observed and proper operation of the control system in order to determine whether a problem exists.**

**Knowledge of:**

Loop and data sheets

Operating manuals and procedures

P&amp;ID drawings

Problem-solving techniques

Process control

**Skill in:**

Identifying abnormal variations in data or readings from charts, or indicators

Identifying malfunctions in equipment and possible causes for these malfunctions

Reading technical documents

**3. Determine which device or devices of the control system could be causing the observed discrepancies in order to formulate a plan of corrective action.**

**Knowledge of:**

Basic flow, temperature, pressure, and level fundamentals

Electrical fundamentals

Mechanical fundamentals

P&ID drawings

Problem-solving techniques

Process control

**Skill in:**

Communication

Developing alternative solutions to a problem

Identifying abnormal operating conditions

Interpreting P&IDs

Interpreting technical documents

**4. Isolate each suspected device from the control system by following established site procedures in order to perform troubleshooting in a safe manner.**

**Knowledge of:**

Documentation, drawings, & ISA symbol identification

Process control (how systems are connected and the required components for each system)

Safety practices

Systems (e.g., electronics, pneumatics, mechanical, electrical)

**Skill in:**

Following site safety procedures

Identification of safety hazards

Interpreting complex technical documents

Interpreting drawings

**5. Exercise each device across calibrated range in order to determine proper operation.**

**Knowledge of:**

Electrical and mechanical systems

Process control

Site procedures

Use of test equipment

**Skill in:**

Interpreting output readings

Manipulating inputs to a device

Using test equipment

**6. Perform corrective action, if necessary, according to site procedures in order to resolve the problem.**

**Knowledge of:**

Mathematics

Process control

Safety procedures

Site procedures

Systems (e.g., electronics, pneumatics, mechanical, electrical)

**Skill in:**

Checking for variance/error percentage

Implementing detailed action plans

Interpreting data and making comparisons

Using hand tools

Using test equipment

Verifying problem has been corrected

**7. Complete all documentation as required in order to update all records.**

**Knowledge of:**

Site documentation procedures

**Skill in:**

Completing required documentation

**DOMAIN IV: START-UP**

**1. Examine all pertinent documentation in order to verify completion of all control systems that are required for start-up.**

**Knowledge of:**

Loop, data, and calibration sheets

Operation and equipment manuals

P&ID drawings

Site procedures

**Skill in:**

Interpreting calibration data sheets

Interpreting loop sheets

Interpreting P&IDs

Interpreting, organizing, filing, and establishing order for documentation

**2. Implement applicable safety practices to be followed in order to ensure that all personnel are informed of the possible hazards during start-up.**

**Knowledge of:**

Process control

Safety equipment

Site procedures

Systems

**Skill in:**

Communicating safety practices

Demonstrating safety practices

**3. Coordinate activities with all personnel involved in order to ensure that all personnel are aware of their responsibilities during start-up.**

**Knowledge of:**

Basic duties of other disciplines

Systems

**Skill in:**

Assigning tasks

Communicating problems identified during field walkdowns, calibrations, loops checks, etc.

Establishing priorities for start-up

Using hand tools, measuring devices, and test equipment

<b>4. Implement start-up according to site procedures in order to ensure that the system is operating properly.</b>
<b>Knowledge of:</b>
Electrical and mechanical systems
Process control
Proper sequencing of start-up plan
Site procedures
Task assignments
<b>Skill in:</b>
Calibrating, loop checking, and troubleshooting
Following site procedures
Interpreting a start-up plan
Performing task assignments
<b>5. Assist site personnel to identify and correct problems that arise during start-up in order to commission the system.</b>
<b>Knowledge of:</b>
Instruments and loops
Operator interface
Process control
Tools and test equipment
<b>Skill in:</b>
Calibrating
Communicating with others
Troubleshooting
Using tools and test equipment
<b>6. Complete all documentation as required in order to update all records.</b>
<b>Knowledge of:</b>
Required documentation
Site procedures
<b>Skill in:</b>
Completing documentation

**DOMAIN V: MAINTENANCE/REPAIR**

**1. Obtain documents pertaining to the device in order to understand the operation of the device and investigate its performance history.**

**Knowledge of:**

Calibration and data sheets

Manufacturer's documents

Site procedures

**Skill in:**

Evaluating relevant manuals/drawings for available information

Interpreting documentation (technical manuals)

Interpreting P&amp;IDs

**2. Assess the condition of the device through documentation, inspection and testing in order to maintain the device's performance and determine the need for any repairs.**

**Knowledge of:**

Basics of instrument device operation

Calibration and data sheets

Manufacturer's documents

Troubleshooting techniques

**Skill in:**

Isolating instruments for active process hazards

Operating calibration equipment which contains historical information

Using hand tools

Using test/calibration equipment

**3. If required, remove device from service following all site and safety procedures in order to perform needed repairs.**

**Knowledge of:**

Safety procedures

Site procedures

**Skill in:**

Following instrument repair/replace procedures

Implementing repairs with the required manpower

Operating decontamination equipment

**4. If required, decontaminate device in accordance with material safety data sheets, site, and safety procedures in order to ensure safe conditions.**

**Knowledge of:**

Manufacturer's documents

MSDS documents

Safety procedures

Site procedures

**Skill in:**

Following procedures for decontamination

Observing all safety procedures required for process integrity and personnel safety

<b>5. Perform any applicable repairs by following proper procedures in order to return the device to service.</b>
<b>Knowledge of:</b>
Electrical fundamentals
Instrument's operation and maintenance manual
Mechanical fundamentals
Site procedures
<b>Skill in:</b>
Disassembling and reassembling the instrument
Following site procedures
Repairing the instrument
Using hand tools
<b>6. If required, recalibrate the device following site procedures in order to ensure proper operation.</b>
<b>Knowledge of:</b>
Calibration procedures
Electrical fundamentals
Mechanical fundamentals
Site procedures
Test equipment
<b>Skill in:</b>
Following calibration procedures
Following site procedures
Using hand tools
Using test equipment
<b>7. Complete all documentation as required in order to update all device and maintenance records.</b>
<b>Knowledge of:</b>
Calibration procedures
Site procedures
<b>Skill in:</b>
Completing documentation
Following procedures

**DOMAIN VI: PROJECT ORGANIZATION**

**1. Obtain documents pertaining to the control project in order to understand all requirements of the control project.**

**Knowledge of:**

P&IDs, loop sheets, instrument index, etc.

Safety procedures

Site procedures

**Skill in:**

Following oral instructions

Following written instructions

Interpreting loop sheets

Interpreting P&IDs

Interpreting technical documents

**2. Communicate with necessary personnel in order to define the activities required for control project completion.**

**Knowledge of:**

Basic duties of other disciplines

Project planning

Written and oral communication techniques

**Skill in:**

Communicating

Technical writing

**3. Participate in control project planning in order to coordinate all resources for the project.**

**Knowledge of:**

Basic duties of other disciplines

Personnel resources

Project planning

Start-up

Task assignments

**Skill in:**

Communication

Interpreting procedures

Technical writing

**4. Supervise all necessary personnel to ensure compliance with site procedures in order to direct the control project in a safe and efficient manner.**

**Knowledge of:**

Individual responsibilities

Overall project

Site procedures

Supervision

Time management

**Skill in:**

Assessing abilities of personnel

Communicating

Following procedures

Planning

Scheduling

**5. Monitor all necessary resources in order to control variances from the project plan.**

**Knowledge of:**

Organizational planning and scheduling techniques

Overall project

Site procedures

**Skill in:**

Assessing abilities of personnel

Communicating

Following procedures

Planning

Scheduling

Time management

**6. Complete all documentation as required in order to update all records.****Knowledge of:**

P&amp;IDs, loop sheets, etc.

Site procedures

**Skill in:**

Completing documentation

Following procedures

## DOMAIN VII: ADMINISTRATION

### 1. Obtain a current set of site procedures in order to comply with requirements.

#### Knowledge of:

Location of site procedures

#### Skill in:

Procuring information

### 2. Verify that the instrument index, P&IDs, loop diagrams, etc. are current in order to ensure compliance with site procedures and job specifications.

#### Knowledge of:

Latest revisions

#### Skill in:

Interpreting documents

Procuring documents

### 3. Organize all calibration and data sheets, loop drawings, P&IDs, IOM manuals, instrument location, and installation details in order to maintain compliance with site procedures.

#### Knowledge of:

Leadership techniques

Organizational methods

#### Skill in:

Communicating

Leading others

Organizing

### 4. Verify that certifications of test equipment and personnel are current and on file in order to ensure compliance with site procedures.

#### Knowledge of:

Organizational methods

Proper instrument test certification

Proper personnel test certification

#### Skill in:

Communicating

Reading technical information/manuals

### 5. Develop a tracking system for the receipt, storage, and issuing of instruments onsite in order to control resources of the project.

#### Knowledge of:

Methods for instrument identification

Shipping and receiving

Site procedures

#### Skill in:

Observing, inspecting

Organizational techniques

Technical writing

### 6. Review all calibration sheets and completed loop checks in order to ensure accuracy and completeness of the documents.

#### Knowledge of:

Calibrations sheets and loop drawings

Communication methods

#### Skill in:

Observing, inspecting

Organizational techniques

Technical writing

**7. Sign off all documentation as complete and accurate in order to comply with site procedures.**

**Knowledge of:**

Organizational methods

P&IDs, loop drawings, calibration sheets, etc.

Site procedures

**Skill in:**

Organizational techniques

**8. Generate as-built drawings in order to provide accurate and current drawings.**

**Knowledge of:**

Drafting techniques

P&IDs, loop drawings, etc.

**Skill in:**

Communicating

Drafting

Observing installed work

Technical writing

**9. Assemble proper documents in order to archive historical data and to complete the project.**

**Knowledge of:**

Organizational methods

Site procedures

**Skill in:**

Communicating

Organizational techniques