

## Overview

This standard identifies the competences you need to carry out corrective maintenance activities to process controller equipment, in accordance with approved procedures. You will be required to maintain a range of process controller equipment, such as fixed I/O, rack mount and modular systems. This will involve dismantling, removing and replacing faulty peripheral components, process controller units and components, down to unit and board level. You will also need to be able to load and download process controller programs, check them for errors, make alterations to programs, and create and maintain back-up copies of completed programs.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, process control system, tools or equipment used, that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work with minimal supervision, taking personal responsibility for your actions, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying maintenance procedures to process controller systems. You will understand the maintenance methods and procedures used, and their application, and will know about the various process controller units and peripheral components, their functions and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and ensuring that the equipment operates to the required specification and remains compliant with all standards and regulations. You will also know about the interaction of the other associated integrated technologies, and will have sufficient knowledge to carry out the dismantling and reassembly of the process controller system, safely and effectively.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

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## Performance criteria

*You must be able to:*

1. work safely at all times, complying with health and safety legislation and other relevant regulations, directives and guidelines
2. follow the relevant maintenance schedules to carry out the required work
3. carry out the maintenance activities within the limits of your personal authority
4. carry out the maintenance activities in the specified sequence and in an agreed timescale
5. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
6. complete and store all relevant maintenance documentation in accordance with organisational requirements
7. dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition

## Knowledge and understanding

### *You need to know and understand:*

1. the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on you
2. the isolation and lock-off procedure or permit-to-work procedure that applies to the process control system being worked on
3. the specific health and safety precautions to be applied during the maintenance activity, and their effects on others
4. how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source) including the difference of AC and DC electrical shock and how this affects the victim
5. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
6. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities, and where this can be obtained
7. the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD)
8. hazards associated with carrying out maintenance activities on process control systems (such as handling fluids, stored pressure/force, electrical supplies, process controller interface, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise them to reduce any risks
9. how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, symbols used on process controller documents and other documents needed in the maintenance process
10. the basic principles of how the system functions, its operation sequence, the working purpose of individual units/components and how they interact
11. the devices and systems for storing programs
12. procedures to be applied to the storage, location and method of backing up programs
13. the different types of interface cards and their application
14. the procedures and application of 'design and development' computer-based authoring software

15. the numbering system and codes used for identification of inputs and outputs
16. how to search the user program within the process controller for specific elements
17. programming techniques and codes used (such as interlocking, timers, counters, subroutines)
18. the techniques involved in editing, entering and removing contacts from lines of logic and, where applicable, the procedure to be followed for 'on' and 'off-line' programming
19. the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance process
20. organisational policy on the repair/replacement of components during the maintenance process
21. the techniques used to dismantle/assemble integrated equipment (such as release of pressures/force, proofmarking to aid assembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections)
22. methods of attaching identification marks/labels to removed components or cables, to assist with reassembly
23. methods of checking that components are fit for purpose, and the need to replace batteries, boards and other failed items
24. how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for their intended purpose
25. the importance of making 'off-load' checks before proving the equipment with the electrical supply on
26. the generation of maintenance documentation and/or reports following the maintenance activity
27. the equipment operating and control procedures to be applied during the maintenance activity
28. how to use lifting and handling equipment correctly and safely in the maintenance activity
29. the problems that can occur during the maintenance of the process control system, and how they can be overcome
30. the organisational procedure to be adopted for the safe disposal of waste of all types of material
31. the extent of your own authority and to whom you should report if you have

problems that you cannot resolve

## Scope/range

1.

Carry out all of the following during the maintenance activities:

- 1.1 plan and communicate the maintenance activities to cause minimal disruption to normal working
- 1.2 obtain and use the correct issue of organisational and/or manufacturers' drawings and maintenance documentation
- 1.3 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work including the electricity at work regulations
- 1.4 ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids)
- 1.5 provide and maintain safe access and working arrangements for the maintenance area
- 1.6 carry out the maintenance activities using appropriate techniques and procedures
- 1.7 re-connect and return the system to service on completion of the maintenance activities
- 1.8 record the results of the maintenance activity and report any defects found
- 1.9 dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition

2.

Carry out maintenance activities on one of the following types of process control equipment:

- 2.1 fixed input/output (I/O)
- 2.2 modular
- 2.3 rack mount

3.

Carry out seven of the following program maintenance activities on the process control system:

- 3.1 select and use appropriate programming devices (such as terminals, hand-held programmers and personal computers)
- 3.2 programme by computer-based authoring (to include subroutines)
- 3.3 use ladder logic, statement lists, or system flowcharts
- 3.4 carry out on-line monitoring of programs
- 3.5 produce back-ups of completed programs
- 3.6 use on' and off-line' programming
- 3.7 edit, enter and remove contacts from lines of logic
- 3.8 use single-step mode of operation
- 3.9 load, read and save programs
- 3.10 alter counter and timer settings

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### 3.11 force contacts on and off

4.

Carry out all of the following during the maintenance activities:

- 4.1 take electrostatic precautions when handling components and circuit boards
- 4.2 proofmarking or labelling of removed wires and components
- 4.3 replace peripherals (such as sensors, actuators, relays, switches)
- 4.4 inspect components for serviceability
- 4.5 use run mode of operation
- 4.6 check back-up batteries and replace where applicable
- 4.7 change or add circuit boards (where applicable)
- 4.8 replace process controller units
- 4.9 replace power supplies (where applicable)
- 4.10 functionally test the system

5.

Maintain process control equipment in compliance with one of the following:

- 5.1 organisational guidelines and codes of practice
- 5.2 BS, ISO and/or BSEN standards
- 5.3 equipment manufacturer's operation range
- 5.4 current wiring regulations

6.

Complete and store all relevant maintenance documentation in accordance with organisational requirements, using one of the following:

- 6.1 job cards
- 6.2 permits to work/formal risk assessment and/or sign-on/off procedures
- 6.3 maintenance log or report
- 6.4 organisational-specific documentation
- 6.5 electronic reports

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