

## Overview

This standard identifies the competences you need to locate faults on electrical equipment and circuits, in accordance with approved procedures. You will be required to locate faults on electrical equipment, using single, three-phase or direct current power supplies, and which will include control systems, motors and starters, switchgear and distribution panels, control systems, electrical equipment, wiring enclosures and luminaires. You will be expected to use a variety of methods and procedures to assist in locating the fault, including gathering information from the person that reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment.

Your responsibilities will require you to comply with organisational policy and procedures for the fault location activities undertaken, and to report any problems with these activities, or with the tools and equipment used, that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will be sufficient to provide a sound understanding of your work, and will provide an informed approach to applying fault location procedures to electrical equipment and circuits. You will have an understanding of the basic fault location methods and techniques used, and their application. You will also know how to interpret information obtained from fault finding aids and equipment, in adequate depth to provide a sound basis for carrying out the activities.

You will understand the safety precautions required when carrying out the fault location activities, especially those for isolating the equipment. You will also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

## SEMEMI209 - SQA Unit Code HF4A 04

Carrying out fault location on electrical equipment and circuits

### Performance criteria

---

*You must be able to:*

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 review and use all relevant information on the symptoms and problems associated with the products or assets
- P3 investigate and establish the most likely causes of the faults
- P4 select, use and apply diagnostic techniques, tools and aids to locate faults
- P5 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved
- P6 determine the implications of the fault for other work and for safety considerations
- P7 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault
- P8 record details on the extent and location of the faults in an appropriate format

## SEMEMI209 - SQA Unit Code HF4A 04

Carrying out fault location on electrical equipment and circuits

### Knowledge and understanding

---

*You need to know and understand:*

- K1 the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on you
- K2 the isolation and lock-off procedure or permit-to-work procedure that applies in the work area
- K3 what constitutes a hazardous voltage and how to recognise victims of electric shock
- K4 the importance of wearing protective clothing and other appropriate safety equipment (PPE) during fault location activities
- K5 the hazards associated with carrying out fault location activities on electrical equipment (live electrical components, stored energy, misuse of tools), and how they can be minimised
- K6 how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
- K7 the procedure to be adopted to establish the background of the fault
- K8 how to use the various diagnostic aids to help identify the location of the fault
- K9 the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics)
- K10 how to evaluate sensory information (such as by sight, sound, smell, touch)
- K11 how to assess evidence and evaluate the possible causes of faults/problems
- K12 how to use a range of fault diagnostic equipment to investigate the problem
- K13 the care, handling and application of electrical test equipment (such as multimeter, portable appliance tester, earth loop impedance tester, insulation resistance tester)
- K14 how to check that electrical test equipment is within calibration, and that it is free from damage and defects
- K15 how to use and extract information from drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS 7671/IET wiring regulations, and other documents needed in the fault location process
- K16 the basic principles of how the circuit functions, its operating sequence, the purpose of individual units/components and how they interact
- K17 how to evaluate the likely risk to yourself and others, and the effects the fault could have on the overall process or system
- K18 the problems that can occur during the fault location activity, and how they can be minimised
- K19 the importance of completing the correct documentation following the maintenance activity
- K20 the extent of your own authority and to whom you should report if you

**SEMEMI209 - SQA Unit Code HF4A 04**

Carrying out fault location on electrical equipment and circuits

have problems that you cannot resolve

---

## SEMEMI209 - SQA Unit Code HF4A 04

Carrying out fault location on electrical equipment and circuits

### Additional Information

---

#### Scope/range related to performance criteria

*You must be able to:*

1. Carry out **all** of the following during the fault locating activity:
  - 1.1. plan the fault location methods and procedures in conjunction with others
  - 1.2. use the correct issue of company 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
  - 1.4. ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids)
  - 1.5. ensure that safe access and working arrangements have been provided for the maintenance area
  - 1.6. carry out the fault location activities, using approved procedures
  - 1.7. identify the fault, and consider appropriate corrective action
  - 1.8. in conjunction with others, take actions to resolve the problem
  - 1.9. dispose of waste items in a safe and environmentally acceptable manner
  - 1.10. leave the work area in a safe and tidy condition
  
2. Carry out fault location on **one** of the following types of electrical circuit:
  - 2.1. single phase power circuits
  - 2.2. direct current power circuits
  - 2.3. three-phase power circuits
  - 2.4. single phase lighting circuit

plus **two** of the following types of electrical equipment:

  - 2.5. switchgear and distribution panels
  - 2.6. electrical plant
  - 2.7. luminaires
  - 2.8. portable appliances
  - 2.9. motors and starters
  - 2.10. control systems and components
  - 2.11. other specific electrical equipment
  
3. Use **four** of the following diagnostic techniques, tools and aids to assist in locating the fault:
  - 3.1. information gathered from the person that reported the fault
  - 3.2. fault finding techniques (such as six point, half-split, input/output, unit substitution, emergent sequence)
  - 3.3. diagnostic aids (such as manuals, flow charts, troubleshooting guides, electronic aids, equipment records)
  - 3.4. inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings)
  - 3.5. operating (such as manually switching off and on, RCD test)

## SEMEMI209 - SQA Unit Code HF4A 04

Carrying out fault location on electrical equipment and circuits

buttons, running the equipment)

---

4. Use **two** of the following types of instruments to assist in locating faults:
  - 4.1. multimeter
  - 4.2. insulation resistance tester
  - 4.3. light meter
  - 4.4. portable appliance tester
  - 4.5. earth loop impedance tester
  - 4.6. other specific test/measurement instruments
  
5. Locate faults that have resulted in **two** of the following breakdown categories:
  - 5.1. intermittent fault
  - 5.2. partial failure or reduced performance
  - 5.3. complete breakdown
  
6. Complete **one** of the following maintenance records and pass it to the appropriate person:
  - 6.1. scheduled maintenance report
  - 6.2. corrective maintenance report
  - 6.3. company specific report

**SEMEMI209 - SQA Unit Code HF4A 04**

Carrying out fault location on electrical equipment and circuits

<b>Developed by</b>	SEMTA
<b>Version number</b>	2
<b>Date approved</b>	February 2015
<b>Indicative review date</b>	March 2018
<b>Validity</b>	Current
<b>Status</b>	Original
<b>Originating organisation</b>	SEMTA
<b>Original URN</b>	SEMEMI2-09
<b>Relevant occupations</b>	Maintenance fitter
<b>Suite</b>	Engineering Maintenance And Installation Suite 2
<b>Key words</b>	Engineering; manufacturing; maintenance; fault location; electrical; power supply; process plant; motors; starters; switchgear