



Australian Government

MEM18103 Fault-find, test and rectify electrical circuits and equipment

Release: 3

MEM18103 Fault-find, test and rectify electrical circuits and equipment

Modification History

Release 3. Prerequisite units updated

Release 2. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities

Release 1. New unit

Application

This unit of competency has been developed for Engineering Tradesperson – industrial electrician apprenticeship training and the recognition of trade-level skills in finding and rectifying faults in electrical circuits and equipment.

It covers safe fault finding testing and procedures in a range of electrical circuits and equipment as well as the rectification of those faults in accordance with the relevant standards.

This unit covers the skills and knowledge required to meet the Electrical Regulatory Authorities Council (ERAC).

Essential Performance Capability (EPC) classified as ‘critical’:

- EPC 54 – Demonstrate the knowledge and skills for diagnosing and rectifying faults in electrical apparatus and associated circuits.

Some jurisdictions require the holder of this unit to be licensed or certified and users should check with the relevant authorities.

Band: A

Unit Weight: 4

Pre-requisite Unit

MEM10016	Terminate and test electrical wiring and accessories
MEM10018	Select cable types and sizes to suit loads and electrical installation environment
MEM10019	Select circuit protection devices by type and rating, fit to switchboards and install earthing
MEM12023	Perform engineering measurements
MEM18001	Use hand tools

MEM18100	Fault-find, test and rectify AC machines and circuits
MEM18102	Fault-find, test and rectify single and three-phase transformers
MEM18104	Dismantle, replace and assemble electrical components and equipment

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.								
1. Determine job requirements	<table><tr><td>1.1</td><td>Follow standard operating procedures (SOPs)</td></tr><tr><td>1.2</td><td>Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures</td></tr><tr><td>1.3</td><td>Use appropriate personal protective equipment (PPE) in accordance with SOPs</td></tr><tr><td>1.4</td><td>Research the nature of the fault through checking of documentation and/or consultation with appropriate person/s</td></tr></table>	1.1	Follow standard operating procedures (SOPs)	1.2	Comply with work health and safety (WHS) requirements at all times, including appropriate risk control measures	1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs	1.4	Research the nature of the fault through checking of documentation and/or consultation with appropriate person/s
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2. Prepare to fault find and rectify electrical circuits and equipment	<table><tr><td>2.1</td><td>Obtain all necessary tools, equipment and testing instruments needed to conduct fault diagnosis and repair of electrical circuits and equipment</td></tr><tr><td>2.2</td><td>Isolate and tag circuits and equipment in accordance with procedures</td></tr></table>	2.1	Obtain all necessary tools, equipment and testing instruments needed to conduct fault diagnosis and repair of electrical circuits and equipment	2.2	Isolate and tag circuits and equipment in accordance with procedures				
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3. Fault find and rectify electrical circuits and equipment	<table><tr><td>3.1</td><td>Apply diagnostic techniques to locate faults in electrical circuits and equipment, including the use of specialised test equipment</td></tr><tr><td>3.2</td><td>Dismantle equipment, where necessary, and repair/replace faulty items and reassemble using appropriate tools and equipment in accordance with</td></tr></table>	3.1	Apply diagnostic techniques to locate faults in electrical circuits and equipment, including the use of specialised test equipment	3.2	Dismantle equipment, where necessary, and repair/replace faulty items and reassemble using appropriate tools and equipment in accordance with				
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manufacturer specifications and regulatory requirements

3.3 Test repaired electrical circuits and equipment to ensure functionality and compliance

3.4 Document reasons and all necessary repairs in accordance with SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Circuits include two (2) or more of the following:

- power distribution
- lighting control
- distributed control system (DCS) instrument loop control
- motor control
- package unit control

Single circuit may be controlled by one or more devices and the output may control one or more devices

Complex circuit is defined as interdependent circuits and applies to interconnected electrical circuits where electrical equipment and/or components are connected electrically, that is there are multiple electrical power supplies or sources, voltages or circuits which are found in the control or switching of the circuit

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Equipment includes three (3) or more of the following single and three-phase appliances:	• single-phase appliances – hand held power tools, fridges, microwaves, TV's, lighting, motors, air conditioning units, air compressors, portable pumps, pedestal drills, lathes, bench grinders, motors, fans and fan motors • three phase appliances – variable speed drives (VSDs), fan and pump motors, welding machines, freezer units, heaters, general commercial kitchen equipment, generators, air conditioning units, air compressors and air blowers
Diagnostic techniques include:	• testing for voltage, current, frequency, polarity, phase, circuit continuity, insulation resistance and earth continuity
Test equipment includes one (1) or more of the following:	• continuity testers • ammeters • voltmeters • multimeters • tong testers • wattmeters • cathode ray oscilloscopes (CROs)
Regulatory requirements include:	• AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules)
Safe working practices include:	• demonstration of safe working practices and installation in accordance with industry established safe and sound practices

Unit Mapping Information

Release 2. Equivalent. Minor adjustments to reflect ERAC requirements for electrician licensing and revision of Essential Performance Capabilities.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM18103 Fault-find, test and rectify electrical circuits and equipment

Modification History

Release 3. Prerequisite units updated

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Release 1. New unit

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting circuits, drawings and specifications relevant to the work to be undertaken
- determining the electrical and non-electrical isolation requirements to prevent the creation of hazards linked from the loss of machine/system/process control according to established procedures
- using lock out tag procedures with appropriate tags/signs
- proving electrical isolation and following established safety rules prior to working on electrical equipment or wiring
- ensuring all electrical equipment and tools are tested and tagged and up to date
- applying methodical diagnostic techniques and using safe working practices to fault find electrical circuits and equipment
- using test equipment, including the use of multimeters, cathode ray oscilloscopes (CROs), signal/function generators and power supplies in diagnosing faults in electrical circuits and equipment
- taking measurements and compare the results to the calculated value
- dismantling, repairing and replacing faulty components and equipment using appropriate hand and power tools and engineering techniques
- carrying out electrical tests for continuity and insulation resistance tests on single and three-phase appliances and equipment
- repairing faulty electrical installation circuits, components and wiring to comply with relevant standards
- retesting according to regulatory and legislative requirements
- documenting all reasons and remedial action taken in accordance with SOPs.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- safe work practices and procedures and use of personal protective equipment (PPE)
- fault finding techniques, including:
 - visual inspection
 - signal injection and measurement
 - half split rule and component isolation
 - interpreting wiring and equipment circuits, drawings and specifications
- test equipment for diagnosing faults including multimeters, ammeters, voltmeters, continuity testers, wattmeters and tong testers
- specialised alternating current (AC) test equipment, including:
 - CRO and its operating features, interpreting a CRO screen, dual trace CROs and its advantage over a single trace CRO and CRO applications
 - signal, function generators and power supplies and their operating features and applications when fault finding AC circuits
- diagnostic techniques, including testing for voltage, current, frequency, polarity, phase, circuit continuity, insulation resistance and earth continuity
- wiring faults, including short circuit, open-circuit, high resistance, breakdown in insulation resistance, residual current device (RCD) tripping, transposition of conductors, earthing, loose connections and corrosion
- power distribution, lighting control, signal and data, motor control and package unit control circuits
- lighting faults, including switching, lamp holders, ballast, starter, capacitor, igniter, transformer, loose connections, poor contact, corrosion and lighting management systems
- equipment faults in the following single-phase appliances:
 - hand held power tools, fridges, microwaves, hot water systems, TV's, motors, air conditioning units, air compressors, portable pumps, pedestal drills, lathes, bench grinders, motors, fans and fan motors
- equipment faults in the following three-phase appliances:
 - variable speed drives (VSDs), fan and pump motors, freezer units, welding machines, heaters, general commercial kitchen equipment, generators, air conditioning units, air compressors and air blowers
- mechanical faults in motors, including bearings, fans, bent shaft, locked rotor, blocked air vents, centrifugal switches, slipping belts and environmental factors.

Assessment Conditions

- Assessors must:
 - have vocational competency in fault finding, testing and rectifying electrical circuits and equipment at least to the level being assessed with relevant industry knowledge and experience

- satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* and comply with the *National Vocational Education and Training Regulator Act 2011* or equivalent legislation covering VET regulation in a non-referring State as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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