



Australian Government

UEEEL0024 Test and connect alternating current (a.c.) rotating machines

Release: 2

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Modification History

Release 2. This is the second release of this unit of competency in the UEE Electrotechnology Training Package.

Typographical error fixed in performance criteria 2.5

Workplace evidence requirements updated in Performance Evidence and Assessment Conditions.

Assessor requirements updated in Assessment Conditions.

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to test and connect alternating current (a.c.) rotating machines. It includes safe working practices, ascertaining correct operation of a.c. machines and solving problems as they apply to servicing, fault finding, installation and compliance work functions

The skills and knowledge described in this unit require a licence or permit to practice in the workplace where work is carried out on electrical installations which are designed to operate at voltages greater than 50 volt (V) a.c. or 120 V direct current (d.c.).

Competency development activities in this unit are subject to regulations directly related to licensing. Where a licence or permit to practice is not held, a relevant contract of training, such as an Australian Apprenticeship, may be required.

Additional and/or other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to work health and safety (WHS)/occupational health and safety (OHS) regulations.

Pre-requisite Unit

UEECD0007 Apply work health and safety regulations, codes and practices in the workplace

UEECD0019 Fabricate, assemble and dismantle utilities industry components

UEECD0020 Fix and secure electrotechnology equipment

UEECD0051 Use drawings, diagrams, schedules, standards, codes and specifications

UEEEL0021 Solve problems in magnetic and electromagnetic devices

UEEEL0019 Solve problems in direct current (d.c.) machines

UEEEL0020 Solve problems in low voltage a.c. circuits

UEEEL0023 Terminate cables, cords and accessories for low voltage circuits

and

UEECD0043 Solve problems in direct current circuits

or

UEECD0044 Solve problems in multiple path circuits

UEECD0046 Solve problems in single path circuits

Competency Field

Electrical

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to test and connect a.c. rotating machines

2 Test and connect a.c. rotating machines

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 1.1** Nature of machine/s problem is obtained from relevant documentation or work supervisor to determine scope of work
- 1.2** WHS/OHS requirements and workplace procedures for a given work area are identified and applied
- 1.3** Hazards are identified, risks are assessed, and control measures are implemented
- 1.4** Materials required for work are determined in accordance with workplace procedures
- 1.5** Tools, equipment and testing devices required for work are obtained and confirmed fit for purpose and serviceable in accordance with workplace procedures
- 2.1** WHS/OHS risk control measures and workplace procedures for carrying out work are followed
- 2.2** Need to test or measure live work is determined in accordance with WHS/OHS job safety assessment

requirements and work is conducted using safety control measures and workplace procedures

- 2.3 Relevant circuits, machines and/or plant are checked as being isolated, as required in accordance with WHS/OHS requirements and workplace procedures
- 2.4 Problem-solving techniques are used to resolve problems from measured and calculated values as they apply to a.c. rotating machines
- 2.5 Machine is verified as electrically safe and connected to electrical supply and commissioned in accordance with workplace procedures and industry standards
- 2.6 Unplanned situations are dealt with safely and with the approval of an authorised person/s
- 2.7 Problems dealt with safely and without damage to machines, the surrounding environment or services using sustainable energy practices

3 Complete work and document activities

- 3.1 WHS/OHS work completion risk control measures and workplace procedures are followed
- 3.2 Worksite is cleaned and made safe in accordance with workplace procedures
- 3.3 Justification for solutions used to solve problems is documented in accordance with workplace procedures
- 3.4 Work completion is documented and an appropriate person/s notified in accordance with workplace procedures

Foundation Skills

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

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Testing and connecting a.c. rotating machines must include at least three of the following types of motor (must include at least one single phase and one three phase):

- capacitor start capacitor run motors
- capacitor start motors
- permanent magnet motor
- permanently split capacitor motor
- portable generator
- shaded pole motor
- split phase motors
- standby generator
- three phase squirrel-cage motor
- three phase synchronous generator
- three phase synchronous motor
- three phase wound rotor motor
- universal motor.

Unit Mapping Information

No equivalent unit.

Links

Companion Volume Implementation Guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEEEL0024 Test and connect alternating current (a.c.) rotating machines

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least two separate occasions and include:

- # applying work health and safety (WHS)/occupational health and safety (OHS) workplace procedures, including:
 - # identifying and assessing hazards and risks, and implementing control measures
 - # checking circuits are isolated in accordance with workplace procedures and regulatory requirements
- # applying testing and connecting techniques in alternating current (a.c.) rotating machines, including:
 - # connecting, running and reversing the direction of a single phase motor
- applying testing and connecting techniques in alternating current (a.c.) rotating machines, including:
 - connecting three phase induction motor in both star and delta connections
 - connecting, running and reversing the direction of a three phase motor
 - determining the operating parameters of existing machines
 - altering an existing machine connection or circuit to comply with specified operating parameters
 - developing machines/circuits to comply with a specified function and operating parameters
 - determining the cause of low efficiency in an existing machine
 - performing insulation resistance, continuity and winding identification tests
 - identifying faults/faulty components in single and three phase motors
 - testing insulation resistance of a three phase induction motor prior to connection to the supply

- testing winding resistance (ohmic value and continuity) of a three phase induction motor prior to connection to the supply
- # applying sustainable energy principles and practices
- completing problem-solving activities documentation.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- operating principles of three phase induction motors, including:
 - speed of rotation of a rotating magnetic field
 - relationship between the rotor speed, slip and rotor frequency
 - basic principle of operation of an induction motor
 - motor action in a generator and generator action in a motor
- three phase induction motor construction, including:
 - basic component parts of a three phase induction motor
 - types of rotors (standard and wound) used in three phase induction motors
 - connections for three phase induction motor in both star and delta
- three phase induction motor characteristics, including:
 - relationship between torque, speed, and power and interpretation of speed/torque curves of induction motors
 - squirrel cage motors operating characteristics conditions necessary for an induction motor to produce maximum torque
 - operating characteristics of an induction motor from nameplate information and by measurement
 - induction motors efficiency and minimum energy performance standards (MEPS)
 - full load efficiency and power factor of induction motors
- split phase - single phase motors, including:
 - identification of split phase induction motors
 - principles of operation of a split phase induction motor
 - construction and basic characteristics of a split phase induction motor
 - applications of split phase induction motors
- single phase motors – capacitor and shaded pole types, including identification of single phase induction motors, including:
 - capacitor start
 - capacitor start/capacitor run, permanent split capacitor (PSC) and shaded pole
 - principles of operation of each motor type listed above
 - operating characteristics and typical applications of each motor type listed above
 - reversing the direction of rotation of each of the motors listed above
- single phase motors – series universal, including:

- principles of operation of a series universal motor
- identification and functions of each of the basic parts of a series universal motor
- operating characteristics and typical uses for a series universal motor
- motor protection, including:
 - reasons why motor protection is required
 - requirements of the AS/NZS 3000 with regards to motor protection
 - types of motor overload protection
 - operating principles of thermal cut-out devices, thermal and magnetic motor protection devices for single and three phase motors
 - electrical features of motor protection high rupturing capacity (HRC) fuses
 - effects of undervoltage and overvoltage on motors and motor circuits
 - effects of repetitive starting and/or reversing on motors
 - special requirements for motor protection in high humidity or moist environments, high temperature areas and corrosive atmospheres
 - operating principles of phase failure protection
 - selecting suitable protective devices for a given motor and starter combination
- three phase synchronous machines- operation principles and construction, including:
 - power transfer diagram of an a.c. synchronous machine
 - generation of a sinusoidal waveform
 - operation of a synchronous alternator
 - operation of a synchronous motor
 - principles of operation of an asynchronous generator (induction generator)
 - identification of main parts of a synchronous alternator/motor
 - methods used to provide the excitation of a synchronous alternator/motor
 - block diagram of an alternator voltage regulator
 - advantages gained by the parallel operation of alternators
 - starting methods of synchronous motors
- alternators and generators, including:
 - effects on the generated voltage of variations in excitation
 - effects on generated voltage of variations in load current and power factor
 - identification of characteristic curves of an alternator
 - types of prime movers used with single and three phase portable/standby alternators
 - manual operation of single and three phase portable/standby alternators
 - ratings of single and three phase portable/standby alternators
 - applications of single and three phase portable/standby alternators
 - construction details of single and three phase portable/standby alternators
 - common faults found in portable/standby alternators
 - parallel connection
 - load sharing
 - standby generators and associated arrangements

- safe testing methods for locating faults in low voltage (LV) a.c machines, including:
 - insulation resistance
 - coil resistance
 - centrifugal switch
 - capacitor
 - bearing wear
 - locked rotor
 - load
 - thermal overload
 - machine controls
- mechanical faults and associated symptoms that occur in LV a.c rotating machines, including:
 - bearings
 - fans
 - bent shaft
 - locked rotor
 - blocked air vents
 - centrifugal switches
 - environmental factors
- faults on driven loads and couplings and their consequences, including:
 - slipping belts
 - poorly aligned coupling (shims)
 - vibration
 - loads bearing failing
 - load stalling
- electrical faults and associated symptoms that occur in LV a.c rotating machines, including:
 - open and partially open circuit winding
 - short and partially short circuit winding
 - open circuit rotor
 - burnt out winding
 - coil shorted to frame
- relevant manufacturer specifications.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessors must also hold the occupational licence for the jurisdiction the assessment is occurring where the activity being assessed requires a licence to practice.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory

requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in suitable workplace operational situations where it is appropriate to do so, where this is not appropriate, assessment must occur in suitable simulated workplace operational situations that replicate workplace conditions.

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.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or other simulations
- relevant and appropriate materials, tools, facilities, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, relevant industry standards, codes of practice and operation manuals.

In addition, evidence of Performance Evidence items of this unit marked with a hash (#) must be gathered in authentic workplace operational conditions (not simulated) before final determination of competence in this unit can be made.

Links

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