



Australian Government

UEEEL0021 Solve problems in magnetic and electromagnetic devices

Release: 2

UEEEL0021 Solve problems in magnetic and electromagnetic devices

Modification History

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

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 determine correct operation of electromagnetic devices and related circuits and provide solutions as they apply to electrical installations and equipment.

It includes working safely; applying power circuit problem-solving processes, including the use of testing and measuring devices; and providing solutions derived from measurements and calculations to predictable problems in electromagnetic devices and related circuits.

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) alternating current (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 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 work with electromagnetic devices and circuits

PERFORMANCE CRITERIA

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

1.1 WHS/OHS requirements and workplace procedures for a given work area are identified and applied

1.2 Device/s and/or circuit/s problems are identified from documentation or work supervisor to determine scope of work

1.3 Hazards are identified, risks are assessed and control measures are implemented

1.4 Tools, equipment and testing devices to carry out work are obtained and checked for correct operation and safety

1.5 Circuits are checked and isolated in accordance with workplace procedures and regulatory requirements

1.6 Advice is sought from the work supervisor to ensure work is coordinated effectively with others

2 Solve electromagnetic device and/or circuit problems

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 workplace procedures

2.3 Relevant circuits and devices are checked as being isolated, as required, in accordance with WHS/OHS

requirements and workplace procedures

- 2.4 Operating parameters of an existing circuit with an electromagnetic device are determined
 - 2.5 Methodical techniques are used to resolve circuit problems from measured and calculated values as they apply to electromagnetic devices/circuits
 - 2.6 Existing circuit with an electromagnetic device is altered to comply with specified operating parameters
 - 2.7 Circuit with electromagnetic device is developed to comply with a specified function and operating parameters
 - 2.8 Electrical equipment is connected and tested to determine correct operation
 - 2.9 Unplanned situations are responded to in accordance with workplace procedures in a manner that minimises risk to personnel and equipment
 - 2.10 Problems are resolved without damage to apparatus, circuits, the surrounding environment or services using sustainable energy practices
- 3 Complete work and documentation**
- 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 resolve problems is documented in accordance with established workplace procedures
 - 3.4 Work completion is documented and 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.

Electromagnetic devices must include at least three of the following devices:

- reed switches
- solenoids
- relays
- contactors
- inductive limit switches
- lifting magnets
- core balance devices
- magnetic overloads
- magnetic brakes
- magnetic circuit breakers.

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 UEEEL0021 Solve problems in magnetic and electromagnetic devices

Modification History

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

Assessor requirements updated in Assessment Conditions.

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

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) requirements, including:
 - identifying hazards and assessing risks and applying control measures
 - confirming isolation of circuits
- using methodological techniques to solve problems in circuits with an electromagnetic device from measured and calculated values
- determining the operating parameters of an existing circuit with an electromagnetic device, including:
 - the direction of magnetic field around a current-carrying conductor and a coil
 - a current-carrying conductor under the influence of a magnetic field
- modifying an existing circuit with an electromagnetic device to comply with specified operating parameters
- connecting electromagnetic devices to comply with a specified function and operating parameters
- completing work and documenting activities.

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:

- magnetism, including:
 - common magnetic and non-magnetic materials
 - magnetic field patterns of magnets

- magnets attraction and repulsion when brought in contact with each other
- practical applications of magnets
- principle of magnetic screening (shielding) and its applications
- electromagnetism, including:
 - conventions representing direction of current flow in a conductor
 - direction of force between adjacent current-carrying conductors
 - effect of current, length and distance apart on the force between conductors
 - magnetic field around an electromagnet, a single conductor and two adjacent conductors carrying current
 - magnetomotive force (mmf) and its relationship to the number of turns in a coil and the current flowing in the coil
 - practical applications of electromagnets
- magnetic circuit types and associated terminology
- methods used to reduce electrical losses in a magnetic circuit
- electromagnetic induction, including:
 - principle of electromagnetic induction
 - applications of electromagnetic induction
 - Lenz's law
- inductance, including:
 - applications of the different types of inductors
 - industry standard symbols for inductors
 - types of inductor cores
 - construction of an inductor
 - definition of terms: self-induction, inductance and mutual inductance, and time constants
 - effect of physical parameters on the inductance of an inductor
 - relationship between load voltage, current and self-induced electromagnetic force in a direct current (d.c.) circuit having inductance
 - practical applications for the effects of self and mutual induction
 - undesirable effects of self and mutual induction
- magnetic principles in measurement instruments
- magnetic devices, including:
 - operation and application of:
 - magnetic sensing devices
 - contactors and relays
 - solenoids
 - magnetic methods used to extinguish the arc between opening contacts
- 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 workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in 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.

Links

Companion Volume Implementation Guides are found in VETNet -

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