



Australian Government

Assessment Requirements for UEEIC0042

Solve problems in single phase electronic power control circuits

Release: 1

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Modification History

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 relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including implementing risk control measures
- applying sustainable energy principles and practices
- evaluating problem resolutions, testing for effectiveness and modifying as required
- meeting scheduled timelines
- preparing and solving problems in single phase electronic power control systems
- using tools, equipment and testing devices
- obtaining and checking tools and equipment
- dealing with unplanned events/situations in accordance with workplace procedures in a manner that minimises risk to personnel and equipment.

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:

- introduction to power control, including:
 - advantages and benefits of power control
 - need for power control and typical applications
 - power control methods
 - types of solid-state switches
 - block diagram of a power converter
 - power control terminology
 - modes of operation
- single phase power rectifiers, including:
 - single phase rectifier circuit configurations
 - resistive/inductive loads

- output voltages/waveforms
- ripple voltage frequency
- peak reverse voltages
- freewheeling diodes
- silicon controlled rectifiers (SCRs), including:
 - construction and symbol
 - basic operating principles
 - characteristics
 - gate requirements
 - commutation
 - electrical ratings
 - testing SCRs
 - applications
- triacs and gate turn off (GTO) thyristors, including:
 - triac construction and symbol
 - triac basic operating principles
 - triac characteristics
 - triac triggering modes
 - triac electrical ratings
 - triac testing
 - GTO construction and symbol
 - GTO basic operating principles
 - GTO characteristics
 - GTO electrical ratings
 - applications for triac and GTOs
- power transistors bipolar junction transistor (BJT), including:
 - BJT construction and symbol
 - BJT basic operating principles
 - BJT characteristics
 - BJT electrical ratings
 - BJT testing
 - applications for BJTs
- power field effect transistors (FET), including:
 - types of FETs used for power control
 - power FETs construction and symbol
 - FET basic operating principles and characteristics
 - insulated gate bipolar transistor (IGBT) basic operating principles and characteristics
 - power FET electrical ratings
 - power FET Testing

- applications for power FETs
- triggering devices diac, including:
 - construction and symbol
 - operating principles
 - breakover voltage
 - unijunction transistors (UJT)s
 - construction and symbol
 - operating principles
 - intrinsic stand-off ratio and peak point voltage
- programmable unijunction transistors (PUTs) including:
 - construction and symbol
 - operating principles
 - programmable standoff ratio
 - peak point voltage
- triggering circuits, including:
 - R-C time constant circuits
 - diac trigger circuit operation
 - UJT relaxation oscillator circuit operation
 - PUT relaxation oscillator circuit
- half wave-controlled rectification, including:
 - phase shift control
 - controlled rectifiers
 - controlled rectifier power output control
 - single phase half wave-controlled rectifier
 - circuit configuration
 - circuit operation
 - waveforms
 - load voltage
 - applications and limitations
 - problems associated with phase shift control
- full wave-controlled bridge rectification including:
 - single phase full wave-controlled bridge rectifier circuit
 - output voltage
 - output waveforms
 - applications and limitations
 - advantages and disadvantages
- fully controlled bridge rectification, including:
 - single phase fully controlled rectifier bridge circuit
 - output voltage

- output waveforms
- applications and limitations
- advantages and disadvantages
- single phase alternating current (a.c.) voltage control, including:
 - phase control of a.c. power
 - circuit configurations - half and full control circuits
 - triggering circuits
 - circuit performance and operation on resistive and inductive loads
 - output voltage and waveform, determination of output voltage using circuit characteristics
 - range of control with inductive loads
 - triggering problems associated with inductive loads
 - applications and limitations
- zero voltage switching (ZVS), including:
 - operating principles
 - circuit configuration, including trigger circuits
 - circuit operation and waveforms resistive loads only
 - relationship between load power and conduction time
 - solid state relays: types and ratings
 - applications and limitations
- fault finding of power control circuits, including:
 - fault-finding procedures
 - typical faults power and trigger circuits
 - characteristics displayed by common faults
 - comparison of test data with expected data (voltage/current waveforms)
 - location and replacement of faulty components
- job safety assessments or risk mitigation processes, including risk control measures
- relevant manufacturer specifications
- relevant tools, equipment and testing devices
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace policies and procedures
- single phase electronic power control circuits
- solutions to single phase electronic power control problems
- sustainable energy principles and practices.

Assessment Conditions

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

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, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, 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>