



Australian Government

UEEIC0040 Solve problems in polyphase electronic power control circuits

Release: 1

UEEIC0040 Solve problems in polyphase electronic power control circuits

Modification History

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 solve problems in polyphase electronic power control circuits.

It includes preparing and solving problems in polyphase electronic power control circuits. It also includes testing and documenting solutions.

Typical polyphase electronic power control problems are those encountered in meeting performance requirements and industry compliance standards, revising control operating parameters and dealing with control malfunctions.

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, is 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

UEECD0020 Fix and secure electrotechnology equipment

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

UEEEL0003 Arrange circuits, control and protection for electrical installations

UEEEL0020 Solve problems in low voltage a.c. circuits

UEEEL0023 Terminate cables, cords and accessories for low voltage circuits

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

UEEEL0021 Solve problems in magnetic and electromagnetic devices

UEEEL0008 Evaluate and modify low voltage heating equipment and controls

UEEEL0009 Evaluate and modify low voltage lighting circuits, equipment and controls

UEEEL0010 Evaluate and modify low voltage socket outlets circuits

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

UEEEL0025 Test and connect transformers

UEEIC0020 Fault find and repair analogue circuits and components in electronic control systems

UEEIC0042 Solve problems in single phase electronic power control 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

Instrumentation & Control

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Identify problems in polyphase electronic power control circuits

PERFORMANCE CRITERIA

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

- 1.1** WHS/OHS requirements and workplace procedures are identified and applied
- 1.2** Hazards are identified, risks are assessed and control measures implemented
- 1.3** Extent of polyphase electronic power control problems are determined from performance specifications, situation reports and consultations with relevant person/s
- 1.4** Work activities are planned to meet scheduled timelines in consultation with relevant person/s

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|---|------------|--|
| | 1.5 | Tools, equipment and testing devices needed for work are obtained in accordance with workplace procedures and checked for correct operation and safety |
| 2 Solve problems in polyphase electronic power control circuits | 2.1 | WHS/OHS risk control measures and workplace procedures for carrying out the work are followed |
| | 2.2 | Polyphase electronic power control devices, circuit operation characteristics and applications are applied to developing solutions to control problems |
| | 2.3 | Parameters, specifications and performance requirements in relation to each polyphase electronic power control problem are obtained in accordance with workplace procedures |
| | 2.4 | Solutions to polyphase electronic power control problems are evaluated to determine most effective resolution |
| | 2.5 | Unplanned situations are responded to in accordance with workplace procedures in a manner that minimises risk to personnel and equipment |
| | 2.6 | Problems are resolved using sustainable energy practices and principles without wasting materials, damaging apparatus, the surrounding environment or services in accordance with workplace procedures |
| 3 Test and document solutions to polyphase electronic power control problems | 3.1 | WHS/OHS risk control measures and procedures for carrying out the work are followed |
| | 3.2 | Solutions to polyphase electronic power control problems are tested to determine effectiveness and modified, as required |
| | 3.3 | Solutions are documented, including instructions for implementation, incorporating risk control measures |
| | 3.4 | Solutions used to solve polyphase electronic power control problems are justified and documented 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.

Solving electrical problems in polyphase electronic power control circuits must include at least four of the following:

- polyphase electronic power control circuits

Unit Mapping Information

This unit replaces and is equivalent to UEENEEI149A Solve problems in polyphase electronic power control circuits.

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 UEEIC0040 Solve problems in polyphase electronic power control circuits

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
- dealing with unplanned events/situations in accordance with workplace procedures in a manner that minimises risk to personnel and equipment
- determining the extent of the polyphase electronic power control problem
- developing, evaluating and testing solutions to polyphase electronic power control problem
- documenting justification of solutions implemented in accordance with workplace procedures
- following scheduled timeframes
- obtaining electronic device and circuit parameters, specifications and performance requirements appropriate to each problem
- resolving problems in polyphase electronic power control circuits
- testing and documenting solutions to polyphase electronic power control circuits.

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:

- job safety assessments or risk mitigation processes, including risk control measures
- three phase rectifier circuits, including:
 - three phase circuit configurations
 - resistive/inductive loads
 - output voltages/waveforms
 - ripple voltage/frequency
 - peak reverse voltages
 - freewheeling diodes
 - measurement of rectifier output parameters

- three phase half wave-controlled rectifiers, including:
 - phase control
 - purpose/operation of half wave-controlled rectifiers
 - circuit configuration
 - rectifier performance and operation - resistive loads
 - output voltage resistive load
 - rectifier performance and operation - inductive loads
 - rectifier output waveforms
 - applications and limitations
 - advantages and disadvantages three phase half wave-controlled rectifiers
- three phase half-controlled bridge rectifier, including:
 - purpose/operation of a half-controlled bridge rectifiers
 - circuit configuration and connections
 - rectifier output - resistive loads
 - output voltage resistive loads
 - rectifier output - inductive loads
 - output voltage - inductive loads
 - flywheel diode
 - output voltage calculations
 - applications and limitations
 - advantages and disadvantages three phase half-controlled bridge rectifiers
- three phase fully controlled bridge rectifier, including:
 - purpose/operation of a fully controlled bridge rectifiers
 - circuit configuration and connections
 - rectifier output - resistive loads
 - output voltage resistive loads
 - rectifier output - inductive loads
 - output voltage - inductive loads
 - flywheel diode
 - output voltage calculations
 - applications and limitations
 - advantages and disadvantages three phase fully controlled bridge rectifiers
- three phase alternating current (a.c.) controllers, including:
 - circuit configurations
 - circuit operation
 - triacs and silicon controlled rectifier (SCR) circuits
 - triggering requirements
 - output voltage and waveforms
 - determination of output voltage

- applications
- advantages and disadvantages
- direct current (d.c.) converters, including:
 - purpose and operation of d.c. converters
 - circuit configurations
 - voltage control methods
 - forced commutation methods
 - calculation of load voltage
 - output voltage/waveforms
 - applications
 - advantages and disadvantages
- cyclo-converters, including:
 - purpose/operation of a cyclo-converter
 - basic circuit configurations
 - measurement of output voltage
 - calculation of load voltage
 - output voltage/waveforms
 - applications and limitations
 - advantages and disadvantages
- inverters, including:
 - purpose/operation of an inverter
 - basic circuit configurations
 - measurement of inverter outputs
 - output voltage
 - applications and limitations
 - advantages and disadvantages
- thyristor protection, including:
 - power control devices failure
 - protection techniques
 - snubber networks
 - series inductors
 - amp trap high rupturing capacity (HRC) fuses
 - gate pulse suppression
- installation of thyristor devices and circuits, including:
 - need for heat sinking of power thyristor devices
 - heat sink features and types
 - installation methods for all types of thyristor packages
 - basic thermal model, only to demonstrate the effect of different heat sink
 - types and profiles and installation methods on thyristor junction temperature
- series and parallel thyristor connections, including:

- purpose of series/parallel connection
- series connections
- reasons
- operational problems
- parallel connections
- reasons
- operational problems
- fault finding three phase thyristor 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
- problem-solving techniques
- relevant manufacturer specifications
- relevant tools, equipment and testing devices
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace policies and procedures
- 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.

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