



Australian Government

UEEEL0062 Provide engineering solutions to problems in complex polyphase power circuits

Release: 1

UEEEL0062 Provide engineering solutions to problems in complex polyphase power 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 provide engineering solutions to problems in complex polyphase power circuits at balanced and unbalanced conditions.

It includes working safely, applying problem-solving techniques, using electrical measuring devices, and providing solutions from measurements and calculations and justification for solutions.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

UEECD0036 Provide engineering solutions for problems in complex multiple path circuits

UEEEL0020 Solve problems in low voltage a.c. circuits

Competency Field

Electrical

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to develop engineering solutions in complex polyphase

PERFORMANCE CRITERIA

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

1.1 Work health and safety (WHS)/occupational health and safety (OHS) processes and workplace procedures for a given work area are identified, obtained and applied

power circuit problems

- | | | |
|----------|--|--|
| | 1.2 | WHS/OHS risk control work preparation measures and workplace procedures are followed |
| | 1.3 | Scope of complex polyphase power circuit problems is identified from documentation and/or work instructions |
| | 1.4 | Advice is sought from the work supervisor to ensure the work is coordinated effectively with others |
| | 1.5 | Sources of materials required for work are identified in accordance with workplace procedures |
| | 1.6 | Tools, equipment and testing devices required for work are obtained and checked for correct operation and safety |
| 2 | Provide engineering solutions to problems | |
| | 2.1 | WHS/OHS risk control work measures and procedures are followed |
| | 2.2 | The need to test and measure live electrical work is determined in accordance with WHS/OHS requirements and workplace procedures |
| | 2.3 | Circuits are checked and isolated in accordance with WHS/OHS requirements and workplace procedures |
| | 2.4 | Complex polyphase power circuit problems are solved from interpreting measurements and calculated values in accordance with workplace procedures |
| | 2.5 | Unplanned situations are dealt with safely and with the approval of relevant person/s |
| | 2.6 | Problems are solved without damage to apparatus, circuits, the environment and/or services using sustainable energy practices |
| 3 | Complete work and document solutions | |
| | 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 complex polyphase power circuit problems is documented |
| | 3.4 | Work completion is documented and relevant 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.

Unit Mapping Information

This unit replaces and is equivalent to UEENEEG149A Provide engineering solutions to problems in complex polyphase power 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 UEEEL0062 Provide engineering solutions to problems in complex polyphase power 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 and performance criteria on at least one occasion and include:

- determining the operating parameters of existing circuit
- using established problem-solving methods
- taking relevant measurements accurately
- interpreting measured values appropriately
- providing effective solutions to circuit problems from measurements and calculations
- giving written justification of solutions provided
- dealing with unplanned events
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including using risk control measures
- checking and isolating circuits
- documenting completed work and notifying relevant person/s
- identifying sources of materials required for work
- identifying the scope of the complex polyphase power circuit problems
- preparing for problems in complex polyphase power circuits
- testing and measuring live work
- using tools, equipment and testing equipment.

Knowledge Evidence

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

- polyphase power circuit analysis, including:
 - polyphase supply system encompassing:
 - advantage of three phase system compared to single phase systems
 - double subscript notation
 - phase sequence
 - 120 degree operator
 - given circuit component parameters, solve practically-based problems using:

- equivalent circuits of transformers, lines and loads
 - component values using rectangular and polar notation
 - current divider and potential divider rules using complex impedances
 - the “per unit” values of voltage, current and impedance to a common VA base
- types of three phase system connections encompassing:
 - supply to balanced star, three and four wire loads
 - supply to delta connected loads
 - effects of phase reversal
 - representation of currents and voltages as complex phasors for three phase, and three phase and neutral quantities
 - calculation of the values of, and drawing labelled phasor diagrams, not to scale, to represent complex values of current and voltage for balanced and unbalanced loads for star and delta systems
 - calculation of values of P, Q and S for balanced and unbalanced systems
 - draw and label single phase diagrams to represent one phase of a complex three phase system
 - represent unbalanced voltages or currents as symmetrical components
 - phase-to-phase currents
 - phase-to-neutral/earth currents
- balanced three phase loads encompassing:
 - calculations of balanced loads connected in star
 - calculations of balanced loads connected in delta
 - calculation of steady state values of fault current for various configurations
 - evaluation of the symmetrical component impedances for the various distribution system components, transformers (earthed neutral case) and generators (high impedance earth)
 - calculation of fault currents using the per unit approach
 - calculation using the “worst case” values based on transformer impedance only (i.e. a short circuit fault)
 - estimation of peak values using accepted multipliers
 - effects of the direct current (d.c.) component on the instantaneous magnitudes of fault currents in transformers and generators
- unbalanced three phase loads encompassing:
 - star – four wire systems
 - delta systems
 - star – three wire systems
 - star - four wire with neutral impedance
- power in three phase circuits encompassing:
 - summation of phase powers and power in balanced loads
 - measurement of power in balanced loads – two Wattmeter methods
- reactive three phase power encompassing:

- power triangle calculation
- measurement of VAR
- power factor correction
- fault currents encompassing:
 - symmetrical components
 - positive, negative and zero sequence impedance
 - fault current breaking and let-through energy capacities of circuit breakers and fuses
 - importance of fault/arc impedance
 - calculation of fault currents - phase-to-earth faults
 - calculation of fault currents - phase-to-phase faults
 - analysis of asymmetrical fault currents
- harmonics in three phase systems encompassing:
 - presence of triple in harmonics in three phase systems
 - effects of three phase harmonics for different star and delta connections
 - methods for reducing harmonics in three phase systems
- problem-solving techniques
- relevant checks and isolation of circuits
- relevant manufacturer specifications and operating instructions
- relevant materials, tools, equipment and testing devices
- relevant job safety assessments or risk mitigation processes
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace instructions, policies and procedures.

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 suitable workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated suitable 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 simulations
- relevant and appropriate materials, tools, facilities and equipment currently used in industry
- resources that reflect current industry practices in relation to providing engineering solutions for solving problems in complex polyphase power circuits

- 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>