Australian Government

Department of Education, Employment and Workplace Relations

UEENEED007B Develop, enter and verify programs for programmable logic controllers using ladder instruction set

Release: 1

UEENEED007B Develop, enter and verify programs for programmable logic controllers using ladder instruction set

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

1.1) **Descriptor**

This unit covers development, installation and testing of programs for programmable logic controllers (PLC) for a system requiring extended control functions. It encompasses working safely, applying knowledge of control systems, control system development methods, ladder logic control functions, using ladder instruction set, following written instructions and documenting program development and testing activities.

Application of the Unit

Application of the Unit **4**)

This unit is intended to augment formally-acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Note:
1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus, site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Licensing/Regulatory Information

1.2) License to practice

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **2)**

2.1) Competencies

There are no prerequisite competencies for this unit.

Employability Skills Information

Employability Skills **3)**
The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the Element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to develop enter and verify program.	1.1 OHS procedures for a given work area are identified, obtained and understood through established routines and procedures.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 Safety hazards that have not previously been identified are reported and advice on risk control measures is sought from the work supervisor.
	1.4 Control system scenario is determined from job specifications of the process/plant/machine to be controlled, and through consultation with appropriate person(s).
	1.5 Equipment, software and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
	1.6 Installation of programmable controller is checked for compliance with regulations and job specification.
2 Develop control system and enter and test program.	2.1 Established OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures.
	2.3 Control solutions are developed and documented based on the specified control mode and using acceptable methods for designing control systems.
	2.4 Developed control system is converted to an appropriate form, such as flow, state and ladder diagrams, using a personal computer and software applicable to the programmable controller into which the program is to be entered. (See Note 1)

ELEMENT	PERFORMANCE CRITERIA	
	2.5	Program is entered into the programmable control using a personal computer and appropriate software.
	2.6	Entered instructions and settings are tested as meeting those specified in by the control system scenario.
	2.7	Appropriate methods and tools are used to test control systems and operating faults and anomalies are identified and rectified. (See Note 2)
	2.8	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
3 Verify, document and report programming activities.	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Program is transferred from a programmable controller to an external medium for storage. (See Note 3)
	3.3	Control system specification and program are documented in accordance with established procedures.
	3.4	Work completion is reported and appropriate personnel notified in accordance with established procedures.

ELEMENT **PERFORMANCE CRITERIA**

Note.
1. Example of control functions are derived timers (off delay, self resetting, constant duty cycle), reversible counters, cascading timers, cascading counters, combining timers and counters, internal relays/flags/markers, latching relays (set/reset), jump instructions, master control instructions, bit shift registers, scan time considerations, one shot, retentive (power fail) functions, simple step sequence instructions
2. Examples of control system testing methods and tools are monitor mode as an aid to fault finding, inbuilt hardware/software diagnostics and use of error codes.
3. Examples of storage mediums are IC storage, hard disks, servers .

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

7) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and developing, entering and verifying programs for programmable logic controllers using ladder instruction set.
All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.
The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

2.3.8	Programmable controller basics
2.3.9	PLC programming basics
2.3.10.1	PLC programming
2.7.13	Electrical installations, programmable logic controller requirements
2.18.1	Occupational Health and Safety principles

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.
The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)
Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.
Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.
The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment. Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

EVIDENCE GUIDE

Critical aspects of evidence required to demonstrate competency in this unit

9.2)
Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit . It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop, enter and verify programs for programmable logic controllers using ladder instruction set as described in 8) and including:

    A Developing a control system solution to the required operating functions and parameters.

    B Identifying non-compliance conditions of device installation.

    C Converting control system to a PLC program.

EVIDENCE GUIDE

D Entering programming functions and parameters correctly.

E Transferring programs to a PLC.

F Correcting programming anomalies.

G Testing and verify control system operation.

H Transferring program to external storage.

I Documenting control system and programming clearly.

J Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

Context of and specific resources for assessment

9.3)
This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.
Note:
Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to developing, entering and verifying programs for programmable logic controllers using ladder instrument set.

EVIDENCE GUIDE

Method of assessment	**9.4**) This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'. Note: Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.
Concurrent assessment and relationship with other units	**9.5**) There are no concurrent assessment recommendations for this unit.

Range Statement

RANGE STATEMENT

8) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to developing, entering and verifying programs for programmable logic controllers using ladder instruction set. The program shall include at least five of the following functions/controls:

- Derived timers (off delay)
- Self resetting
- Constant duty cycle
- Reversible counters
- Cascading timers
- Cascading counters
- Combining timers and counters
- Internal relays/flags/markers
- Latching relays (set/reset)
- Jump instructions
- Master control instructions
- Bit shift registers
- Scan time considerations
- One shot
- Retentive (power fail) functions
- Simple step sequence instructions

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not Applicable

Competency Field

2.2) Literacy and numeracy skills
Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading	4	Writing	4	Numeracy	4

2.2) Literacy and numeracy skills

Competency Field **5)**

Computer Systems