



Australian Government

UEENEEI110A Set up and adjust advanced PID process control loops

Release: 2

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Modification History

		UEENEEI110A	Set up and adjust advanced PID process control loops	
Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
2	Editorial	N/A	In Pre-requisites, delete “For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2”.	
2	Editorial	N/A	In Required Skills and Knowledge, insert topic numbering.	
2	Editorial	N/A	Replace “essential knowledge and associated skills” with “required skills and knowledge”.	

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers setting up and adjustment of advanced PID controllers and control elements to specified output. It encompasses working safely and to standards, following set-up and adjustment procedures, applying knowledge of process requirements, testing and reporting.

Application of the Unit

Application of the Unit 2)

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may be used to augment

previously acquired competencies.

Licensing/Regulatory Information

License to practice 3)

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.

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 and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space and lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s) 4)

Competencies 4.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

Prerequisite Unit(s)**4)**

Common Unit Group

UEENEEE1
01A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEE1
04A Solve problems in d.c. Circuits

UEENEEE1
07A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEEI10
1A Use instrumentation drawings, specification, standards and equipment manuals

UEENEEI10
2A Solve problems in pressure measurement components and systems

UEENEEI10
3A Solve problems in density/level measurement components and systems

UEENEEI10
4A Solve problems in flow measurement components and systems

UEENEEI10
5A Solve problems in temperature measurement components and systems

UEENEEI10
6A Set up and adjust PID control loops

Electrical Pathway Group

UEENEEG1
01A Solve problems in electromagnetic devices and related circuits

UEENEEG1
02A Solve problems in low voltage a.c. circuits

Instrumentation and Control Pathway Group

UEENEEE1
19A Solve problems in multiple path extra low voltage (ELV) a.c. circuits

Literacy and numeracy skills 4.2)

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

Employability Skills Information

Employability Skills 5)

This unit contains Employability Skills

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

<p>6) Elements describe the essential outcomes of a competency standard unit</p>	<p>Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.</p>
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Elements and Performance Criteria

ELEMENT

PERFORMANCE CRITERIA

- | | |
|--|---|
| <p>1 Prepare to tune control loop with advance functions</p> | <p>1.1 OHS procedures for a given work area are identified, obtained and understood</p> <p>1.2 Established OHS risk control measures and procedures are followed in preparation for the</p> |
|--|---|

ELEMENT**PERFORMANCE CRITERIA**

		work.
	1.3	Safety hazards that have not previously been identified are noted, and established risk control measures are implemented.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.5	Advanced control loop parameters are identified by reviewing process specification and equipment manuals.
	1.6	Tools, equipment and testing devices needed for the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.7	Preparatory work is checked to ensure no damage has occurred and that work complies with requirements
	1.8	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	1.9	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
2	Tune control loop for advanced functions	2.1 OHS risk control measures and procedures for carrying out the work are followed.
		2.2 Testing/measuring devices are connected and set up in accordance with requirements for a particular control system for advanced functions.
		2.3 Control set-point is established and control loop adjusted in accordance with process specification
		2.4 Process is observed and decisions made in consultation with process operation personnel to readjusted control loop settings to ensure process demand and output quality is met.

ELEMENT**PERFORMANCE CRITERIA**

- | | | |
|---|--|---|
| | 2.5 | Process control loops are readjusted as required and checked. |
| | 2.6 | Established methods for dealing with unexpected situations are discussed with appropriate person or persons and documented. |
| | 2.7 | Unexpected situations are dealt with safely and with the approval of an authorised person. |
| | 2.8 | Ongoing checks of the quality of process output are undertaken to ensure control loop is tuned as required. |
| | 2.9 | Tuning is carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services and using sustainable energy principles. |
| 3 | Completion and report control loop tuning activities | |
| | 3.1 | OHS risk control work completion measures and procedures are followed. |
| | 3.2 | Work site is cleaned and made safe in accordance with established procedures. |
| | 3.3 | Control loop settings are documented and appropriate person(s) notified in accordance with established procedures |

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Evidence shall show that knowledge has been acquired of safe working practices and setting up process measuring and control instruments.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EI11 Advanced process control 0A

Evidence shall show an understanding of advanced process control principles and systems to an extent indicated by the following aspects:

REQUIRED SKILLS AND KNOWLEDGE

- T1 Feedforward control strategy encompassing:
- Need for feedforward control
 - Operating principles
 - Control system adjustments
 - Control system difficulties
 - Feedback trim
 - Configuration diagrams
 - Controller configuration.
- T2 Cascade control strategy encompassing:
- Need for cascade control
 - Operating principles
 - Control system adjustments
 - Control system problems
 - Configuration diagrams
 - Controller configuration.
- T3 Ratio control strategy encompassing:
- Need for ratio control
 - Operating principles
 - Control system adjustments
 - Configuration diagrams
 - Controller configuration
- T4 Batch control strategy encompassing:
- Need for batch control
 - Operating principles
 - Control system adjustments
 - Control system controller requirements
 - Reset windup
 - Configuration diagrams
 - Controller configuration
- T5 Connection of controllers encompassing:
- Control loop power requirements
 - Control loop inputs and outputs
 - Instrument connections
 - Connecting control loops
- T6 Testing of control modes encompassing:

REQUIRED SKILLS AND KNOWLEDGE

- Process controller adjustments
- Process control test equipment
- Bench testing procedures
- Bench test connections
- Bench testing process controllers

T7 Process controllers encompassing:

- PID functions
- Applications of PID modes of control
- Applications of controller options
- Checking/adjustment of controllers
- Reset windup

T8 Tuning and installation of control loops encompassing:

- Application of control valves
- Control valve characteristics
- Installation and commissioning control loops
- Tuning control loops
- Microprocessor controller tuning.

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the 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. 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 influence how/how much 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.

**Critical aspects
of evidence
required to
demonstrate
competency in
this unit**

9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. 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 required skills and knowledge 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, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
 - Set up advanced process measuring and control instruments as listed as described in 8) and including:

- | | |
|---|--|
| A | Identifying advanced control loop parameters |
| B | Adjusting control loop to satisfy process demand and quality |
| C | Documenting control loop settings with established procedures |
| D | Dealing with unplanned events by drawing on required skills and knowledge 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 must 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 by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, the conditions 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 setting up advanced process measuring and control instruments.

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 intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the required skills and knowledge described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEI102 Solve problems in pressure measurement
A components and systems

UEENEEI103 Solve problems in density/level measurement
A components and systems

UEENEEI104 Solve problems in flow measurement components

A	and systems
UEENEEI105 A	Solve problems in temperature measurement components and systems
UEENEEI106 A	Set up and adjust PID control loops

Range Statement

RANGE STATEMENT

10) 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/may be demonstrated in relation to setting-up and adjusting process control loops with advanced functions for optimum stability and the following:

- Feedforward control
- Cascade control
- Ratio control
- Batch control

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

Competency Field	11)
	Instrumentation and Control