Australian Government

UEENEEI106A Set up and adjust PID control loops

Release 2

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

UEENEEI106A Set up and adjust PID control loops

Modification History

Release	Action	Core/Elective	Details	Points
2	Editorial	N/A	Show full pre-req chain in the unit.	
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 providing solutions to predictable problems in process control loops. It encompasses working safely, applying logical problem solving procedures, evaluating performance, the use of measuring devices, providing solutions to predictable control problems, and documenting solutions.

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.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c. However 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 regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting 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 be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Electrical

Instrumentation and Control

Common Unit Group

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

Prerequisite Unit(s) **4)**

UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104A	Solve problems in flow measurement components and systems
UEENEEI105A	Solve problems in temperature measurement components and systems

Electrical Pathway Group

UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in low voltage a.c. circuits

Instrumentation and Control Pathway Group

UEENEEE119A	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 3 Writing 3 Numeracy 3

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

Employability Skills	**5)** 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 competency standard unit	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 work on process control loops	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	OHS risk control work preparation measures and procedures are followed
	1.3	The nature of the control problem is obtained from documentation or from work supervisor to establish the scope of work to be undertaken.
	1.4	Advice is sought from the work supervisor to ensure the work is coordinated effectively with others.
	1.5	Sources of materials that may be required for the work are established in accordance with established procedures.
	1.6	Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety
2 Solve process control loops problems	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and

ELEMENT	PERFORMANCE CRITERIA	
		when necessary conducted within established safety procedures
	2.3	Process controller/transmitters/converters and control loops are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Known solutions that include the use of measured and calculated values are used for solving predictable process control loops problems.
	2.5	Written justification is made for solutions used to solve process control loops problems.
	2.6	Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.7	Problems are solved without damage to apparatus, the surrounding environment or services and using sustainable energy principles.
3 Complete work and provide status report(s)	3.1	OHS risk control work completion measures and procedures are followed.
	3.2	Status report(s) is/are completed and work supervisor notified in accordance with established procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) 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 solving problems in process control loops.

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

KS01-EI106A **Process control loops principles**

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

REQUIRED SKILLS AND KNOWLEDGE

T1 Introduction to control systems encompassing:

- Control loop components
- Purpose of control loop components
- Open and closed loop control
- Control loop block diagram
- Direct acting and reverse acting controllers.

T2 Process control terminology encompassing:

- Process control terms
- Conversion of gain and % proportional band
- Process controller features

T3 Process characteristics encompassing:

- Process control static characteristics
- Process control characteristic terminology
- Effects of change on process control systems
- process characteristics: , resistive lag, capacitive, dead-time, on/off control, proportional control – amplitude – time, proportional plus integral control, proportional plus integral plus derivative control.

T4 Types of control and control modes encompassing:

- Types of control modes
- Effects of set point/process demand changes
- Repeat/minute
- Integral time
- Changing integral time
- Resistance/capacitance networks
- Derivative time
- Reset wind-up

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:

- Process controller adjustments
- Process control test equipment

REQUIRED SKILLS AND KNOWLEDGE

- 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 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 & workplace procedures

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in process control loops as listed as described in 8) and including:

A	Determine the operating parameters of a controller in an existing control loop.
B	Configure/and tune a controller in an existing control loop to comply with specified operating parameters.
C	Configure/and tune a controller to comply with a specified function
D	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 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 solving problems in process control loops.

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 essential knowledge and skills 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:

UEENEEI102A	Solve problems in pressure measurement components and systems
UEENEEI103A	Solve problems in density/level measurement components and systems
UEENEEI104	Solve problems in flow measurement components

A	and systems
UEENEEI105 A	Solve problems in temperature measurement components and systems

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

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 must be demonstrated in relation to a hydraulic or pneumatic controller and a microprocessor-based controller and solving at least two of the following problems:

- Determining the operating parameters of a controller, in an existing control loop
- Configuring/tuning a controller in an existing control loop to comply with specified operating parameters
- Configuring/tuning a controller to comply with a specified function

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