Australian Government

UEENEEI105A Solve problems in temperature measurement components and systems

Release 2

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

UEENEEI105A Solve problems in temperature measurement components and systems

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 setting up temperature measuring components and systems and providing solutions to temperature measurement problems as they apply to various process and control work functions. It encompasses working safely, setting up and calibrating temperature measuring components and systems, problem solving techniques, the use of a range of measuring devices, providing solutions derived from measurements and calculations to predictable problems in temperature measurement components and systems.

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. The unit may also 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 work place. However they are subject to regulations directly related to occupational health and safe and contracts of training such as new 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 competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEI101A	Use instrumentation drawings, specification, standards and equipment manuals

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 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 temperature measurement components and systems	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.

ELEMENT	PERFORMANCE CRITERIA	
	1.3	The nature of the temperature measurement problem is obtained from documentation or from an appropriate person to establish the scope of work to be undertaken.
	1.4	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved or affected by the work.
	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 temperature measurement problems	2.1	OHS risk control work measures and procedures are followed.
	2.2	The need to test or measure any electrical components live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures
	2.3	Temperature measurement apparatus are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Established methods are used to solve measurement problems from tests and calculated values as they apply to flow measurement components and systems.
	2.5	Unexpected situations are dealt with safely and with the approval of an authorised person.
	2.6	Problems are solved using sustainable energy principles and without damage to apparatus, the surrounding environment or services.
3 Complete work and document work activities	3.1	OHS work completion risk control measures and procedures are followed.
	3.2	Work site is cleaned and made safe in

ELEMENT	PERFORMANCE CRITERIA
	accordance with established procedures.
	3.3 Written justification is made for solutions to flow measurement problems.
	3.4 Work completion is documented and appropriate person(s) 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 temperature measurement components and systems.

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

KS01-EI105A Temperature measurement principles

Evidence shall show an understanding temperature measurement used in industrial processes to an extent indicated by the following aspects:

REQUIRED SKILLS AND KNOWLEDGE

T1 Introduction to Temperature Measurement encompassing:

- Temperature measurement terms
- International Temperature Scale
- Temperature scales
- Conversion of temperature readings
- Temperature measuring elements
- Temperature sensor selection factors
- Errors in temperature measurement
- Methods used to reduce errors.
- Types and applications of temperature transducers
- Transducers input/outputs - Measurement and evaluation
- Transducer connections

T2 Resistance Temperature Detectors (RTDs) encompassing:

- Selection of RTDs
- RTD terms
- Determining RTD standard resistance values
- Calculating RTD resistance or temperature
- Selecting RTD configurations
- Using Australian Standards for RTDs

T3 RTD Measuring Circuits encompassing:

- RTD unbalanced Wheatstone bridge circuits
- Calculations of unbalanced Wheatstone bridge circuits voltage outputs
- Non-linear voltage output compensation methods
- Calculations of RTD resistance in Wheatstone bridge circuits
- RTD lead resistance errors
- Compensation method of lead resistance errors
- RTD immersion error

T4 Thermocouples encompassing:

- Thermo-electric effects principles
- Thermocouple thermo electric laws
- Determining thermocouple measuring junction temperature
- EMF distribution in thermocouple circuits
- Calibration of thermocouple measuring instruments
- Characteristics of thermocouples
- Advantages and disadvantages of thermocouples

REQUIRED SKILLS AND KNOWLEDGE

T5 Thermocouple Measuring Circuits encompassing:

- Characteristics of thermocouple connection wires
- Identification of thermocouple connection wires
- Thermocouple measuring junction configurations
- Industrial thermocouple assembly
- Thermowell properties
- Thermocouple fabrication methods
- Handling of thermocouples
- Thermocouple test equipment
- Thermocouple selection
- Thermocouple installation errors

T6 Filled System Thermometers encompassing:

- Liquid in glass thermometers construction
- Filled systems operating principles
- Applications of filled system thermometers.
- Calibration of filled systems

T7 Radiation Thermometers encompassing:

- Radiation pyrometer terms
- Operating principles of radiation thermometers.
- Operating principle of radiation pyrometer measurement
- Construction of optical pyrometers and radiation thermometers.
- Signal conditioning
- Factors affecting the use of radiation thermometers
- Calibration of optical pyrometers and radiation thermometers.

T8 Other Temperature Measuring Techniques encompassing:

- Thermistor characteristics
- Thermistor temperature measuring circuits operation
- Thermistor digital thermometer
- Temperature measurement solid state devices characteristics
- Temperature measurement solid state devices circuits
- Temperature indicators characteristics
- Temperature indicators applications
- Liquid crystals
- Bimetallic thermometers

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 and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Solve problems in temperature measurement systems as listed as described in 8) and including:

A Determining the operating parameters of a temperature measuring system

B Setting up and calibrating a temperature measuring system

C Altering an existing temperature measuring system

	to comply with specified operating parameters
D	Developing a temperature measuring system to comply with a specified function and operating parameters
E	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 temperature measurement systems.

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

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 temperature measurement apparatus and systems as they apply to chemical, industrial or medical processes associated with installation, fault finding, maintenance or development work functions, and, and at least three of the following types temperature measurement problems on at least two occasions:

- Determining the operating parameters of a temperature measuring system
- Setting up and calibrating a temperature measuring system
- Altering an existing temperature measuring system to comply with specified operating parameters
- Developing a temperature measuring system to comply with a specified function and operating parameters

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