

Title	Demonstrate knowledge of temperature measurement systems used in industry		
Level	3	Credits	5

Purpose	People credited with this unit standard are able to: <ul style="list-style-type: none"> – demonstrate knowledge of temperature measurement devices; – describe calibration equipment used for temperature transmitters, elements, and indicators; – determine characteristics and calibrate temperature measurement devices; and – describe methods of temperature instrument installation.
----------------	---

Classification	Industrial Measurement and Control > Industrial Measurement and Control - Theory
-----------------------	--

Available grade	Achieved
------------------------	----------

Guidance Information

- 1 Reference
ANSI/ISA-51.1-1979 (R1993) *Process Instrumentation Terminology*; and all subsequent amendments and replacements.
- 2 Definition
RTD – Resistance Temperature Detector.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of temperature measurement devices.

Performance criteria

- 1.1 Describe principles of thermocouple temperature measurement.

Range	iron/constantan (J), chromel/alumel (K), copper constantan (T), platinum/rhodium (R,S), materials of construction for all components, reference junction, measuring junction.
-------	---
- 1.2 Describe RTD measuring devices and bridge circuits.

Range	platinum thermometer 100ohm at zero degrees centigrade (PT100); 2, 3, and 4 wire bridge circuits.
-------	---

1.3 Describe thermistor and semiconductor temperature devices with reference to their characteristics and applications.

1.4 Describe operating principles of filled system, bimetallic and thermostatic temperature devices.

Range sensing element, fill medium, transmitter, thermostat, temperature range, ambient temperature compensation.

1.5 Describe radiation type temperature devices.

Range optical, thermopile, infrared pyrometer.

1.6 Describe alternative applications of temperature measurement devices.

Range wet dry bulb, humidity.

Outcome 2

Describe calibration equipment used for temperature transmitters, elements, and indicators.

Performance criteria

2.1 Describe safety precautions for working with temperature calibration baths.

Range liquid flashpoint, fluidised sand.

2.2 Describe and apply principles and equipment for calibration of thermocouple transmitters and indicators.

Range potentiometer, dedicated test equipment, ambient temperature, use of millivolt vs temperature tables.

2.3 Describe and apply principles and equipment for calibration of RTD transmitters and indicators.

Range decade resistance box, dedicated test equipment, use of resistance vs. temperature tables.

2.4 Interpret tables supplied for common RTDs.

2.5 Describe temperature calibration equipment.

Range temperature controlled liquid bath, sand bath, dry block calibrator, ice.

Outcome 3

Determine characteristics and calibrate temperature measurement devices.

Performance criteria

3.1 Explain and follow safe work procedures.

Range temperature, boiling liquids.

3.2 Define thermocouple characteristics with the aid of a temperature bath.

Range millivolts per degree centigrade (mV/°C), cold junction stabilisation, cold junction compensation, extension wires, law of intermediate metals, law of intermediate temperatures.

3.3 Calibrate transmitters, indicators, or circuits, to an accuracy specified by the data sheet.

Range thermocouple, RTD.

Outcome 4

Describe methods of temperature instrument installation.

Performance criteria

4.1 Describe thermocouple wiring methods.

Range extension cables, compensation cables, colour codes, cold junction compensation, cold junction stabilisation.

4.2 Describe RTD wiring methods.

Range 2, 3, 4 wire format.

4.3 Describe mounting methods and special applications.

Range thermowells, multiple devices, thermocouples for differential temperature, thermocouples for average temperature, thermopiles.

4.4 Describe design and speed of response of temperature probes and associated thermowells.

Range RTD, thermocouple.

Planned review date	31 December 2021
----------------------------	------------------

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	31 October 1995	31 December 2013
Revision	2	30 October 1997	31 December 2013
Revision	3	3 April 2001	31 December 2013
Review	4	22 June 2001	31 December 2013
Review	5	19 May 2008	31 December 2019
Review	6	28 November 2013	N/A
Rollover	7	28 June 2018	N/A

Consent and Moderation Requirements (CMR) reference

0003

This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Comments on this unit standard

Please contact The Skills Organisation reviewcomments@skills.org.nz if you wish to suggest changes to the content of this unit standard.