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

Purpose	People credited with this unit standard are able to: – 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.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

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	31 December 2027
Rollover	7	28 June 2018	31 December 2027
Review	8	30 January 2025	31 December 2027

Consent and Moderation Requirements (CMR) reference	0003

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