

Title	Demonstrate knowledge of the physical principles of instrumentation systems		
Level	3	Credits	5

Purpose	People credited with this unit standard are able to demonstrate knowledge of the physical principles of: <ul style="list-style-type: none"> – pressure measurement; – level measurement; – temperature measurement; – flow measurement; – density measurement.
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Classification	Industrial Measurement and Control > Industrial Measurement and Control - Theory
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Available grade	Achieved
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Guidance Information

None.

Outcomes and performance criteria
Outcome 1

Demonstrate knowledge of the physical principles of pressure measurement.

Performance criteria

1.1 Describe units used for pressure measurement.

Range gauge pressure, absolute pressure, atmospheric pressure, bar, kilo Pascals (kPa), pounds per square inch (psi), millimetres of water (mmH₂O), millimetres of mercury (mmHg), millibar (mbar).

1.2 Explain gas laws and perform calculations.

Range gas laws – Boyle's Law, Charles' Law, General Gas Law.

1.3 Describe effects of liquid pressure head and perform calculations.

Range level, manometers, head correction.

1.4 Use calculations and tables to convert pressure units.

Range bar, kPa, psi, mmH₂O, mmHg, mbar.

Outcome 2

Demonstrate knowledge of the physical principles of level measurement.

Performance criteria

2.1 Describe effects of liquid pressure head and perform calculations.

Range level, manometers, head correction, density.

2.2 Use calculations and tables to convert pressure units used in level measurement.

Range bar, kilo Pascals (kPa), pounds per square inch (psi), millimetres of water (mmH₂O), millimetres of mercury (mmHg), millibar (mbar).

2.3 Explain Archimedes' Principle as used in displacer level measurement.

Outcome 3

Demonstrate knowledge of the physical principles of temperature measurement.

Performance criteria

3.1 Define common temperature scales.

Range centigrade (°C), fahrenheit (°F), kelvin (K), rankin (R).

3.2 Use calculations to convert units used in temperature measurement.

Range °C, °F, K.

Outcome 4

Demonstrate knowledge of the physical principles of flow measurement.

Performance criteria

4.1 State the units for volumetric and mass flow measurement.

Range cubic metres per second (m³/s), litres/sec (l/s), kilograms per second (kg/sec), pounds per hour (lb/hr), litres/minute (l/min), Normal cubic metres per hour (Nm³/hr), Standard cubic metres per hour (Sm³/hr), tonnes per hour (tonne/hr).

- 4.2 Define laws and equations relating to flow measurement and apply to calculations.

Range Reynolds number, equation of continuity, Bernoulli's equation.

- 4.3 Describe pressure and temperature compensation required on oil, gas and mass flowmeters.

Range turbine, vortex, orifice plate.

Outcome 5

Demonstrate knowledge of the physical principles of density measurement.

Performance criteria

- 5.1 Define terms and units used in density measurement and perform unit conversions by calculation.

Range kilograms per cubic metre (kg/m^3), relative density, specific gravity.

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	28 November 2013	31 December 2027
Rollover and Revision	2	28 June 2018	31 December 2027
Review	3	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>.