Title	**Demonstrate knowledge of industrial measurement processes, standards, and calibration**		
Level	**3**	**Credits**	**4**

Purpose	People credited with this unit standard are able to: – demonstrate knowledge of signal transmission used in pneumatic and electronic instruments; – explain terms used in instrument calibration; – define calibration standards; and – demonstrate knowledge of requirements for calibration equipment and records.

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

Available grade	Achieved

Guidance Information

1 Details of standards relating to primary and secondary measurement can be obtained from Measurement Standards Laboratory (MSL) at http://www.measurement.govt.nz. MSL has primary responsibility to provide measurement standards in accordance with the International System (SI) of units for New Zealand.

2 Total reliability in test results and inspection reports is vital. Accreditation ensures that the laboratory, radiology service or inspection service that carries out these tests or inspections is technically competent. Any testing laboratory should be accredited by a suitable third party accreditation agency such as International Accreditation New Zealand (IANZ) or the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).

3 Reference
ANSI/ISA-51.1-1979 (R1993) *Process Instrumentation Terminology*; and all subsequent amendments and replacements.

4 Definitions
Industry requirements – includes all asset owner requirements; manufacturers' specifications; enterprise requirements which cover the documented workplace policies, procedures, specifications, and business requirements; and quality management requirements relevant to the workplace in which the assessment is carried out.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of signal transmission used in pneumatic and electronic instruments.

Performance criteria

1.1 Define signal standards in accordance with industry requirements.

Range 20-100kPa (3-15psi), 4-20mA, 1-5 V.

1.2 Explain problems associated with the transmission of pneumatic signals over long distances (100m).

Range large volume, small volume termination, transmission delays.

1.3 Explain operating principles and construction of pneumatic relay types.

Range direct acting, reverse acting, bleed, non-bleed.

1.4 Explain calibration procedures for pneumatic relays.

Outcome 2

Explain terms used in instrument calibration.

Performance criteria

2.1 Explain the terms 'range' and ‘span’ and provide examples of application of the terms.

Range lower range value, upper range value.

2.2 Explain the term 'zero elevation' and provide examples of application of the term.

Range -273°C to 100°C, -10 to 50°C.

2.3 Explain the term 'zero suppression' and provide examples of application of the term.

Range 4-20mA, 20-100kPa, 3-15psi.

2.4 Explain the term 'linearity' and provide examples of application of the term.

Range independent, terminal based, zero based.

2.5 Explain calibration terms and provide examples of application of the terms.

Range error, accuracy, accuracy statements, hysteresis, dead band, repeatability, reproducibility.

Outcome 3

Define calibration standards.

Performance criteria

3.1 Define primary measurement standards.

Range Measurement Standard Laboratory (MSL), internationally traceable standards, melting point of tin, triple point of water.

3.2 Define secondary measurement standards.

Range dead weight tester, digital pressure gauge or calibrator, precision traceable resistance temperature detector and indicator.

Outcome 4

Demonstrate knowledge of requirements for calibration equipment and records.

Performance criteria

4.1 Define the requirements and documentation of calibration instruments in terms of certification and regular calibration against National Standards.

4.2 Define accuracy ratio of calibration standard compared to unit under test (UUT).

4.3 Perform calculations of calibration accuracy ratio and provide examples of its application.

4.4 Provide examples of digital sampling and explain their implications in terms of transient (instrument) accuracy.

4.5 Identify the relationship between electronic configurable instrument accuracy and calibration standards.

4.6 Identify ideal requirements for an instrument calibration laboratory in accordance with industry requirements.

Range temperature and humidity controlled environment.

4.7 Describe procedures for recording instrument calibration data in accordance with industry requirements.

Replacement information	This unit standard replaced unit standard 2665.

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.