Title	**Demonstrate knowledge of transducers and strain gauges and their applications in industrial measurement**		
Level	**3**	**Credits**	**7**

Purpose	People credited with this unit standard are able to: – demonstrate knowledge of transducers and their applications in industrial measurement; – demonstrate knowledge of transducer installation requirements; – demonstrate knowledge of strain gauge theory; – demonstrate knowledge of load cells in weighing systems; and – describe weighing system calibration methods.

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

Available grade	Achieved

Guidance Information

None.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of transducers and their applications in industrial measurement.

Performance criteria

1.1 Categorise common transducer types and specify associated units of measurement.

Range transducers – position, velocity, vibration, acceleration; units – metres (m), metres per second (m/s), metres per second squared (m/s^2).

1.2 Describe position transducer types (linear and rotary), compare their features, and identify their applications.

Range potentiometers, linear variable differential transformers and inductors, capacitive, rotary shaft encoders (absolute and incremental).

1.3 Describe velocity transducer types, compare their features, and identify their applications.

Range direct current (DC) tachogenerator, alternating current (AC) tachogenerator, electromagnetic, optical types.

1.4 Describe proximity detector types, compare their features, and identify their applications.

Range types – inductive, capacitive, optical;
applications – eccentricity, linear displacement, proximity, vibration, speed sensing;
rotary equipment applications – turbine, generator, motor rotating shafts.

1.5 Describe vibration transducer types, compare their features, and identify their applications.

Range magnetic, piezo electric.

Outcome 2

Demonstrate knowledge of transducer installation requirements.

Performance criteria

2.1 Describe the installation requirements of inductive and capacitive proximity detectors.

Range speed of response, placement to metals, recessing, placement of other detectors, clearance distances.

Outcome 3

Demonstrate knowledge of strain gauge theory.

Performance criteria

3.1 Define terms associated with strain gauge weighing systems.

Range stress, strain, Young’s modulus (of elasticity), gauge factor.

3.2 Explain the operation of strain gauges based on applied load.

Range stress, strain, original resistance, gauge factor.

3.3 Perform calculations to find change in resistance of strain gauge.

Range stress, strain, original resistance, gauge factor.

3.4 Describe and compare strain gauge types.

Range wire on paper backing, foil etched, semiconductor.

Outcome 4

Demonstrate knowledge of load cells in weighing systems.

Performance criteria

4.1 Describe and compare strain gauge load cells.

Range tensile, compressive, shackle, cantilever beam.

4.2 Describe strain gauge load cells in belt weighing systems.

Outcome 5

Describe weighing system calibration methods.

Performance criteria

5.1 Describe typical methods used for calibrating weighing systems with reference to precision weights, alignment, and bridge measuring circuit calibration.

Replacement information	This unit standard replaced unit standard 2653 and unit standard 2659.

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	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.