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| **Title** | **Demonstrate knowledge of hydraulic and pneumatic control equipment used in industrial process control applications** | | |
| **Level** | **3** | **Credits** | **6** |

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| **Purpose** | This unit standard is designed to provide knowledge of hydraulic and pneumatic equipment used in industrial process control applications. This knowledge may, for example, be used in the commissioning of hydraulic and pneumatic equipment connected to a programmable logic controller.<br><br>People credited with this unit standard are able to demonstrate knowledge of:<br>– hydraulic and pneumatic service equipment;<br>– hydraulic and pneumatic control actuators;<br>– hydraulic and pneumatic control valves;<br>– hydraulic and pneumatic circuit symbols and automatic control circuitry; and<br>– pneumatic logic circuit components. |

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

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| **Available grade** | Achieved |

**Guidance Information**

1 This unit standard has been developed for learning and assessment off-job.

2 References
ISO 1219-1:2012 Fluid power systems and components - Graphic symbols and circuit diagrams - Part 1: Graphic symbols for conventional use and data-processing applications;
ISO 1219-2:2012 *Fluid power systems and components - Graphic symbols and circuit diagrams - Part 2: Circuit diagrams*;
and all subsequent amendments and replacements.

## Outcomes and performance criteria

**Outcome 1**

Demonstrate knowledge of hydraulic and pneumatic service equipment.

**Performance criteria**

1.1 Describe oil filters, their specifications, and their applications.

1.2 Describe diaphragm types, oil pressure relief valves, and their applications.

1.3 Describe accumulators and their applications.

1.4 Explain hazards associated with the use of hydraulic and pneumatic equipment in terms of pressure, stored energy, fire risk, and toxicity.

1.5 Identify oil purity in terms of water content, particulate count, and air content.

1.6 Describe air filters and driers, their specifications, and their applications.

Range manual drain, auto drain.

1.7 Describe air pressure regulators, pressure boosters, and their applications.

Range diaphragm types, relieving, non-relieving, piston type.

1.8 Describe air lubricators and their applications.

Range oil fog types, wick type.

**Outcome 2**

Demonstrate knowledge of hydraulic and pneumatic control actuators.

**Performance criteria**

2.1 Describe hydraulic cylinder types and their applications.

Range single acting spring return, double acting, piston and rack, telescopic.

2.2 Describe hydraulic motors and their applications.

Range oval gear, reciprocating piston, vane type, axial piston.

2.3 Describe pneumatic cylinder types and their applications.

Range single acting spring return, double acting, piston and rack.

2.4 Describe pneumatic air motors and their applications.

2.5 Describe rotary vane actuators and their applications.

2.6 Describe air bag actuators and their applications.

**Outcome 3**

Demonstrate knowledge of hydraulic and pneumatic control valves.

**Performance criteria**

3.1 Describe hydraulic valve types and their applications.

Range poppet, three port two position, five port two position, five port three position.

3.2 Describe interconnection of control valves and actuators.

Range poppet, three port two position, five port two position, five port three position.

3.3 Describe electrical control valve actuations.

Range solenoid valves, servo valves.

3.4 Describe pneumatic valve types and their applications.

Range poppet, three port two position spool, five port two position spool, five port three position spool.

3.5 Correctly identify interconnections of control valve to actuators.

Range poppet, three port two position spool, five port two position spool, five port three position spool.

3.6 Describe electro-pneumatic solenoid control valve actuation.

**Outcome 4**

Demonstrate knowledge of hydraulic and pneumatic circuit symbols and automatic control circuitry.

**Performance criteria**

4.1 Demonstrate the International Standards Organisation (ISO) symbols.

Range cylinders, control valves, exhaust, supply, pilot signals.

4.2 Apply symbols to circuit diagrams for hydraulic and pneumatic equipment.

4.3 Interpret interconnection diagrams for hydraulic and pneumatic control circuits.

Range may include – automatic, semi-automatic, cascade; evidence of one diagram is required.

4.4 Connect hydraulic and pneumatic circuits from an interconnection diagram.

Range may include – automatic, semi-automatic, cascade; evidence of one circuit is required.

**Outcome 5**

Demonstrate knowledge of pneumatic logic circuit components.

**Performance criteria**

5.1 Describe common pneumatic logic components.

5.2 Demonstrate correct interconnection of logic components in logic circuits.

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| **Replacement information** | This unit standard replaced unit standard 2663 and unit standard 2666. |

**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 |

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| **Consent and Moderation Requirements (CMR) reference** | 0003 |

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