

Title	Demonstrate knowledge of pneumatic systems principles and operation		
Level	3	Credits	15

Purpose	<p>This unit standard is intended for people training in mechanical engineering trades.</p> <p>People credited with this unit standard are able to: describe energy in machine applications; demonstrate knowledge of the principles, terminology, and formulas of pneumatic systems; describe pneumatics components and symbology; demonstrate knowledge of pneumatic systems operation and applications; describe pneumatic power system contamination and mitigation; and describe hazards associated with pneumatic systems and their prevention or mitigation.</p>
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Classification	Mechanical Engineering > Fluid Power - Pneumatics
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Available grade	Achieved
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Guidance Information

- 1 Legislation and references
Legislation, regulations and/or industry standards relevant to this unit standard include but are not limited to the:
Health and Safety at Work Act 2015;
The International System of Units (SI), 9th edition (France: Bureau International des Poids et Mesures, 2006). Available at
<https://www.bipm.org/documents/20126/41483022/SI-Brochure-9-EN.pdf>.

Any new, amended or replacement Acts, regulations, standards, codes of practice, guidelines, or authority requirements or conditions affecting this unit standard will take precedence for assessment purposes, pending review of this unit standard.

- 2 Definitions
Accepted industry practice refers to approved codes of practice and standardised procedures accepted by the wider mechanical engineering industry sectors as examples of best practice.
Hazard refers to a person's behaviour where that behaviour has the potential to cause death, injury, or illness to a person (whether or not that behaviour results from physical or mental fatigue, drugs, alcohol, traumatic shock, or another temporary condition that affects a person's behaviour).

Workplace procedures refer to procedures used by the organisation carrying out the work and applicable to the tasks being carried out. They may include but are not limited to standard operating procedures, safety procedures, equipment operating procedures, codes of practice, quality management practices and standards, procedures to comply with legislative and local body requirements.

3 Assessment information

Examples and/or evidence given must be within the context of fluid power or mechanical engineering and must meet applicable workplace procedures and accepted industry practice.

Outcomes and performance criteria

Outcome 1

Describe energy in machine applications.

Performance criteria

1.1 Energy transmission and basic physics as it applies to machines are described.

Range types of energy, conservation of energy, changes of state.

Outcome 2

Demonstrate knowledge of the principles, terminology, and formulas of pneumatic systems.

Performance criteria

2.1 The purpose and advantages of pneumatic systems compared to mechanical and hydraulic systems are described.

2.2 Terminology in the context of a pneumatic system is explained.

Range compressor, prime movers; linear, rotary, radial; pressure, regulators, flow, orifice flow, fluid velocity, pressure drops, force, torque, holding pressure, load, lift, stroke.

2.3 Atmospheric, gauge, absolute pressure, and vacuum are compared and their uses in pneumatic systems are explained.

2.4 Pascal's law is described in terms of how its principles apply to pneumatic systems.

2.5 Bernoulli's principle is described in terms of how it applies to fluid movement and conservation of energy in pneumatic-systems.

2.6 Formulas, charts, or nomographs are used to calculate the performance of pneumatic systems.

Range pressure power, speed, and force, with transposition of variables; examples of variables are – tube diameter and flow rate, cylinder volume (both rod and cap side), motor volumes, actuator speed (both directions) for both linear and rotary.
units – international standard.

Outcome 3

Describe pneumatics components and symbology.

Performance criteria

3.1 Pneumatic system components are described.

Range components – reservoir, gauge, filter, control valves, pump motor, cylinder, accumulator.

3.2 Pneumatic system symbology is described.

Range must include pneumatic circuits;
must include reservoir, gauge, filter, control valves, pump, motor, cylinder, accumulator.

Outcome 4

Demonstrate knowledge of pneumatic systems operation and applications.

Performance criteria

4.1 Pneumatic system operation is described.

Range purpose of components, types of gases, contamination, precision control, operational response rate, difference between air production and air consuming systems.

4.2 Two pneumatic systems applications are identified, and their component functions are explained.

Range examples – automated packaging machine, door opening system, lifting equipment, industrial.

Outcome 5

Describe pneumatic power system contamination and mitigation.

Performance criteria

5.1 Types of pneumatic power system contamination are described.

- 5.2 The effects of contamination on the safe and efficient performance of a pneumatic power system are described.
- 5.3 The identification of contaminants within a pneumatic power system and how to mitigate these are described.

Outcome 6

Describe hazards associated with pneumatic systems and their prevention or mitigation.

Performance criteria

- 6.1 The hazard risk of pressure in pneumatic systems and its prevention or mitigation are described.

Range must include – actuator stopped or stalled, stored energy.

- 6.2 Potential personal injury hazards and their prevention or mitigation are described.

Range must include – tubes, hoses, injection of air into skin and eyes, crushing and pinch points, sudden shoot out, presence of carbon monoxide in system, exposure to compressed air, noise release, injuries to skin, eyes, ears, limbs.

Planned review date	31 December 2027
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	26 October 2023	N/A

Consent and Moderation Requirements (CMR) reference	0014
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Comments on this unit standard

Please contact Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council qualifications@hangaarorau.nz if you wish to suggest changes to the content of this unit standard.