

Title	Demonstrate knowledge of direct current machines for electromechanical maintenance and repair		
Level	3	Credits	8

Purpose	<p>This unit standard covers electricity knowledge for people intending to qualify in the electrical industry in electromechanical maintenance and repair.</p> <p>It provides the underpinning knowledge for those people who have responsibility for the refurbishment of electric machines. This includes dismantling, stripping, rewinding, assembling and testing electric machines.</p> <p>People credited with this unit standard are able to demonstrate knowledge of:</p> <ul style="list-style-type: none"> – the uses of DC power in the electromechanical industry; – DC generators for electromechanical maintenance and repair; – DC motors for electromechanical maintenance and repair; and – maintenance and troubleshooting of DC machines.
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Classification	Electrical Engineering > Electrical Machines
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Available grade	Achieved
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Guidance Information

- 1 This unit standard has been developed for learning and assessment off-job and can be completed by passing the Electrical Apparatus Service Association (EASA) distance learning module *DC motors – DC Power in Industry, DC Electromagnets, DC Generators, DC Motors, DC armatures, Maintenance of DC Equipment, and Troubleshooting DC motors*.
- 2 Definitions
AC – alternating current.
CEMF – counter electromotive force.
DC – direct current.

- 3 For assessment purposes:
- a Candidates will be supplied with formulae involving more than three quantities.
 - b Use of a calculator during assessment is permitted.
 - c Candidates are expected to express calculated values in the relevant *Système Internationale* (SI) units, including multiples and sub-multiples, for example: pico (p) 10^{-12} ; nano (n) 10^{-9} ; micro (μ) 10^{-6} ; milli (m) 10^{-3} ; kilo (k) 10^3 ; mega (M) 10^6 ; Giga (G) 10^9 ; and to be able to convert between them.
 - d Conventional current flow direction (positive to negative) is implied. Trainees should be aware of the opposite direction of electron flow.
- 4 Range
- All activities and evidence presented for all outcomes and performance criteria in this unit standard must be in accordance with industry best practice and the Electrical Apparatus Service Association (EASA) Technical Manual.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the uses of DC power in the electromechanical industry.

Performance criteria

- 1.1 Describe how DC power is used in the electromechanical industry.
- Range may include but is not limited to – generators, motors, electroplating, electroforming, electrolytic refining, arc welding, electromagnets, emergency brakes.
- 1.2 Explain the advantages and disadvantages of using DC power instead of AC power in the electromechanical industry.

Outcome 2

Demonstrate knowledge of DC generators for electromechanical maintenance and repair.

Performance criteria

- 2.1 Describe the construction and operation of a two pole DC generator.
- Range may include but is not limited to – rotation of coil, field, armature, commutator, armature reaction, interpoles.
- 2.2 Describe methods of generator excitation with the aid of circuit schematic sketches.
- Range self-excited shunt, separately excited, compound, output voltage control.

Outcome 3

Demonstrate knowledge of DC motors for electromechanical maintenance and repair.

Performance criteria

3.1 Describe the construction and operation of a two pole DC motor.

Range may include but is not limited to – field, armature, commutator, armature reaction, interpoles, CEMF.

3.2 Explain the method and factors involved in the production of torque in a DC motor.

3.3 Describe methods of motor configurations and variation in torque output with the aid of circuit schematic sketches.

Range series, shunt, compound.

3.4 Describe the winding construction of an armature.

Range may include but is not limited to – lap, wave simplex.

3.5 Describe the losses of a motor.

Range may include but is not limited to – copper, eddy current, windage, hysteresis, commutation.

Outcome 4

Demonstrate knowledge of maintenance and troubleshooting of DC machines.

Performance criteria

4.1 Describe the preventative maintenance requirements of armatures in DC machines.

4.2 Describe a non-invasive maintenance testing procedure for DC machines.

Range may include but is not limited to – visual, observation no-load/on load operation, sound, vibration, commutator arcing, oil and dust accumulations, brush length.

4.3 Explain methods of locating faults in DC machines.

Range may include but is not limited to – field open circuits, field short circuits, armature open circuits, armature short circuits, brush tension, commutator wear, brush sparking, electrical and mechanical vibration, overheating, lack of torque.

Planned review date	31 December 2025
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	26 April 2019	N/A
Review	2	30 January 2025	N/A

Consent and Moderation Requirements (CMR) reference	0003
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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 Waihangara Ara Rau Construction and Infrastructure Workforce Development Council qualifications@waihangaararau.nz if you wish to suggest changes to the content of this unit standard.