

Title	Demonstrate knowledge of d.c. machines		
Level	4	Credits	5

Purpose	<p>This unit standard covers knowledge of direct current (d.c.) motors and generators for electricians and related trades.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> – demonstrate knowledge of the general features of d.c. machines; – demonstrate knowledge of d.c. generators; – demonstrate knowledge of d.c. motors; – demonstrate knowledge of speed control for d.c. motors; – demonstrate knowledge of d.c. motor starters; and – connect and test a d.c. compound motor and starter.
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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.
- 2 Achievement of this unit standard does not by itself imply that trainees may legally perform prescribed electrical work in their own right. Until they are registered and licensed under the Electricity Act 1992, trainees are assisting, and must work under the supervision of a Supervisor of Electrical Work when carrying out prescribed electrical work. If the prescribed electrical work in question is carried out for reward the Supervisor of Electrical Work must hold a valid practising licence.
- 3 **References**
 Electricity Act 1992;
 Electricity (Safety) Regulations 2010;
 Health and Safety at Work Act 2015;
 AS/NZS 3000:2007, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*, including Amendment 1;
 AS/NZS 3760:2003, *In-service safety inspection and testing of electrical equipment*, including Amendment 1;
 and all subsequent amendments and replacements.
- 4 **Definitions**
Current regulations and standards – refers to the requirements of the above references.
Industry practice – those practices that competent practitioners within the industry recognise as current industry best practice.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the general features of d.c. machines.

Performance criteria

- 1.1 Component parts of a d.c. machine are identified using industry terminology.
- 1.2 Methods of excitation are explained with the aid of connection diagrams.
- Range separately excited, series, shunt, compound.
- 1.3 A d.c. motor and a d.c. generator are compared in terms of constructional differences and similarities.
- 1.4 Commutators with associated brushes and brush gear are identified using industry terminology.

Outcome 2

Demonstrate knowledge of d.c. generators.

Range separately excited, series, shunt, compound, carbon brushes, commutator construction.

Performance criteria

- 2.1 Generator load current versus terminal voltage characteristics are explained with the aid of graphs.
- 2.2 Applications for each type of generator are stated with reasons for the choice.
- 2.3 The effects of carbon brush materials and positioning are described.

Outcome 3

Demonstrate knowledge of d.c. motors.

Range separately excited, series, shunt, compound.

Performance criteria

- 3.1 Motor load characteristics are explained with the aid of characteristic graphs.
- Range speed versus current, speed versus torque.

3.2 Non-electronic methods of controlling motor speed are described with the aid of diagrams.

Range series armature resistor, field control.

3.3 Applications for each type of motor are stated with reasons for the choice.

3.4 Effects of different carbon brush materials and brush positioning are identified using industry terminology.

Outcome 4

Demonstrate knowledge of speed control for d.c. motors.

Performance criteria

4.1 Speed controller is described in terms of construction, function, and operating principle, with the aid of a block diagram.

4.2 Applications for four different speed controllers are stated, with reasons for the choice.

4.3 Cooling requirements for d.c. motors used with speed controllers are described.

4.4 Motor speed control using regenerative braking is explained.

Range the Ward Leonard system, efficiency, application.

Outcome 5

Demonstrate knowledge of d.c. motor starters.

Range face plate starter, electronic starter.

Performance criteria

5.1 Motor starters are described in terms of construction, function, and operating principles, with the aid of diagrams.

5.2 Applications for each motor starter are stated with reasons for the choice.

Outcome 6

Connect and test a d.c. compound motor and starter.

Performance criteria

6.1 Connections are made in accordance with industry practice.

6.2 Motor and starter are tested in accordance with current regulations and standards, and industry practice.

- 6.3 Starting and running are verified against design.
- 6.4 Motor speed and current are measured and verified against nameplate data.

Replacement information	This unit standard replaced unit standard 1709.
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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	10 February 1999	31 December 2013
Review	2	26 May 2005	31 December 2013
Review	3	22 August 2008	31 December 2024
Rollover and Revision	4	15 March 2012	31 December 2024
Revision	5	15 January 2014	31 December 2024
Review	6	22 August 2019	31 December 2024

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>.