

Title	Demonstrate knowledge of single-phase transformers		
Level	3	Credits	3

Purpose	<p>This unit standard covers knowledge of single-phase transformer theory 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 construction and operating principles of transformers; – solve problems involving transformers; – determine transformer characteristics by measurement; – demonstrate knowledge of transformer applications; and – demonstrate knowledge of instrument transformers.
----------------	--

Classification	Electrical Engineering > Core Electrical
-----------------------	--

Available grade	Achieved
------------------------	----------

Explanatory notes

- 1 This unit standard has been developed for learning and assessment off-job.
- 2 References
Electricity (Safety) Regulations 2010;
AS/NZS 3000:2007, *Electrical Installations (known as the Australian/New Zealand Wiring Rules)*, including Amendment 1;
and all subsequent amendments and replacements.
- 3 Definitions
The term *current regulations and standards* is used in this unit standard to refer to the requirements of the above references.
The word *transformer* in this unit standard refers to single-phase transformers only.
- 4 For assessment purposes
 - a Candidates shall 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 International (SI) units, including multiples and sub-multiples (pico, nano, micro, milli, kilo, mega, etc) and be able to convert between them.
- 5 Formulae quoted in this unit standard use internationally recognised symbols and units.

Outcomes and evidence requirements

Outcome 1

Demonstrate knowledge of construction and operating principles of transformers.

Range double-wound transformer, auto-transformer.

Evidence requirements

- 1.1 Transformer construction is described with the aid of a sketch and with reference to cores and windings.
- 1.2 Operating principle is described with reference to mutual or self-induction and to regulation by tap changing.

Outcome 2

Solve problems involving transformers.

Evidence requirements

- 2.1 Problems involving primary and secondary turns, voltage, and current are solved for resistive loads.

Range $I_P/I_S = N_S/N_P = V_S/V_P$
- 2.2 Simple problems involving transformer ratings are solved for resistive loads and negligible losses.
- 2.3 The difference between volt-amps and watts is explained with reference to reactive and resistive loads.

Outcome 3

Determine transformer characteristics by measurement.

Range isolating transformer, step-down double-wound transformer, auto-transformer.

Evidence requirements

- 3.1 Voltages across and currents through a resistive load connected to each type of transformer are measured and recorded.
- 3.2 Volt-amps, power in load, and turns ratio are calculated.
- 3.3 Variations between measured and nameplate values are explained in terms of supply variations, transformer losses, and measurement error.

Outcome 4

Demonstrate knowledge of transformer applications.

Evidence requirements

4.1 Double-wound and auto-transformers are compared.

Range physical size, cost and complexity for similar volt-amp, operating voltage ranges, response to load changes (regulation), ambient temperature, ease of cooling, operational requirements.

4.2 Common transformer applications are stated.

Range double-wound transformer – step up and step down of voltage and current, safety isolation, safety extra-low-voltage source, instrumentation;
auto-transformer – reduced-voltage motor starters, voltage regulation, variable-voltage supplies.

4.3 Requirements of current regulations and standards with respect to transformers are stated.

Range extra-low voltage circuits, electric toys, medical and dental apparatus, high-voltage discharge lamps, restrictions for auto-transformers;
for assessment purposes candidates may refer to current regulations and standards.

Outcome 5

Demonstrate knowledge of instrument transformers.

Evidence requirements

5.1 Voltage transformers are described with reference to typical connections, standard voltage ranges, and burden.

5.2 Current transformers are described in terms of principle of operation, typical connections, standard current ranges, burden, and safety precautions.

Range current transformer types – bar, wound primary, measurement and protection types.

5.3 Reasons for using instrument transformers are described in terms of measurement convenience, and personal and property safety.

Range isolation, reduction of voltage and current, remote measurement, metering, indication.

Replacement information	This unit standard replaced unit standard 1203. This unit standard and unit standard 15857 have been replaced by unit standard 29473 and unit standard 29445.
--------------------------------	---

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
Revision	2	3 April 2001	31 December 2013
Review	3	26 May 2005	31 December 2021
Rollover and Revision	4	15 March 2012	31 December 2021
Revision	5	15 January 2014	31 December 2021
Review	6	21 July 2016	31 December 2021

Consent and Moderation Requirements (CMR) reference	0003
--	------

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

Please note

Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.