Off-job Assessments (Practical)

Demonstrate and apply knowledge of AC electric motor control and installation

Level 4 | Credits 5

Name (First/Last):	
Company/Employer:	
National Student Number (NSN): (if known)	Te Pūkenga Number:
Phone Number:	Email:

Te Pūkenga

Introduction

In this assessment

This is a practical assessment to be arranged at the convenience of the training provider.

This assessment covers part of Unit Standard 29444 v2. You must also complete a theory assessment to be awarded the Unit Standard.

The Unit Standard is for people in the electrical and related trades, who need to be able to demonstrate and apply knowledge of knowledge of AC electric motor control and installation.

A copy of the unit standard can be found on the NZQA website http://nzqa.govt.nz/.

There are two parts to the assessment, each part having two tasks. All tasks must be observed by the Assessor/Tutor.

You must demonstrate that you can follow manufacturer's specifications and installation instructions to connect and test **induction motors and starters,** fittings and associated accessories to a supply; test fittings, connections and components for safe operation and compliance; and document the test results. You must also report on whether the actual results were comparable to expected results.

Test sheets, compliance sheets, and report sheets have been provided for you to complete as appropriate.

Legislation and Safety

It is very important for your own safety and the safety of colleagues and customers that you follow safe and sound practice when completing electrical work. Safe and sound practice relating to the installation of electrical equipment is defined in AS/NZS: 3000:2007, Electrical Installations (known as the Australian/New Zealand Wiring Rules).

You may refer to current legislation and Standards (such as AS/NZS: 3000:2007) during assessment.

All activities and evidence presented must comply with legislation, policies and procedures, ethical codes, Standards (such as those listed in Schedule 2 of the Electricity (Safety) Regulations 2010), site/industry practice, and any manufacturer's instructions, specification and data sheets.

Assessor/Tutor sign-off

The Assessor/Tutor will observe you completing all parts of this assessment.

Your assessor may discuss the outcome of this assessment with you. As with all Unit Standard assessments, you need to prove that are competent in all parts of the Unit Standard.

Your assessor / tutor will advise you if you need to provide more evidence to prove your competence. This may be done verbally. They should make notes of any discussions you have regarding this assessment.

Pre-assessment form

Please complete the following, before starting the assessment.

I have completed/produced the following	Yes	No
I understand what is required to achieve competency in this assessment.	☐	☐
I understand what I need to do to submit my assessment material when I have completed it.	☐	☐
I have the knowledge to complete each question.	☐	☐
I understand how I will get my results.	☐	☐
I understand how the appeals process works.	☐	☐
I understand that my results will be reported to NZQA.	☐	☐
I have informed my assessor about any special needs that need to be accommodated.	☐	☐

Assessment

Part 1 – Connect and test three-phase induction motor starters

You must demonstrate that you can follow manufacturer's specifications and installation instructions to connect and test **three-phase induction motors and starters,** fittings and associated accessories to a supply; test fittings, connections and components for safe operation and compliance; and document the test results.

Complete the test sheets. Record details from the nameplate. Record any tests completed (as appropriate or relevant). If a test is not relevant, leave that test blank. You must comment on whether the actual results were comparable to expected results – if not, explain why.

1.1 Install and connect a Star/Delta starter to a three phase induction motor for clockwise rotation (ER3+5).

Type of motor:	Small three phase motor (0.37kW) Star||Delta starter with thermal overload and timer	Accessories (please list):	Protective devices, Fuses, Start buttons , Stop buttons, Emergency stop,
Test equipment:	Insulation resistance tester, multi-meter, controlled load (dynamometer), tachometer, power logger (tester) (if available). Power meter (capable of recording inrush values)		

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Connect the motor and the Star delta starter with remote stop/start station									Specify whether two-wire or three-wire remote station. Develop main and control circuit diagrams in space provided.
	Check circuit connections and for safety									
	Set time delay									Specify time delay setting

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Connect the mains supply observing safety procedures									
	Energise circuit and motor Record voltage, current, p.f., rpm, and direction of rotation									State direction of rotation, reverse if required
	Test start and stop both locally and remotely. Test emergency stop.									Records results
	Test the overloads operation and effectiveness.									Use the space provided
	Adjust the delay timer on the star-delta starter and comment on the results									Comment

This test report does not negate the requirement of testing for ESC or COC compliance by a registered person.

Calculations and notes for thermal overload and timer settings; Other observations

Motor Circuits

Develop diagrams/drawings of main circuit and controls circuit.

Nameplate interpretation

Type of Motor:		**Test Instruments used (please list):**		
Values	Voltage from nameplate	Current from nameplate	r.p.m. from nameplate	p.f. from nameplate

Measured values (Initial direction of rotation)

Values	Measured Voltage	Measured Current	Measured r.p.m.	Calculated/measured p.f.
Report on compared values and findings:	How did this compare with the expected results, are they higher or lower, does that impact on efficiency, is it an indication of a problem with the motor or circuit?			

Motor performance

Did the motor work safely and perform as expected? If No, state why, and what was diagnosed as the fault(s)

1.2 Install and connect a Forward/Reverse starter to a three phase induction motor (ER3+5).

Type of motor:	Small three phase motor (0.37kW) Forward||Reverse starter with thermal overload and intelocks	Accessories (please list):	Protective devices, Fuses, Start buttons , Stop buttons, Emergency stop,
Test equipment:	Insulation resistance tester, multi-meter, controlled load (dynamometer), tachometer, power logger (tester) (if available). Power meter (capable of recording inrush values)		

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Connect the motor and the Forward/Reverse starter with remote stop/start station									Specify whether two-wire or three-wire remote station. Develop main and control circuit diagrams in space provided.
	Check circuit connections and for safety									
	Check interlock mechanism									Specify whether electrical or mechanical
	Connect the mains supply observing safety procedures									
	Energise circuit and motor in forward (Clockwise)									State direction of rotation, reverse if required

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Record voltage, current, p.f., rpm, and direction of rotation									
	Energise circuit and motor in Reverse (Anti-clockwise)									
	Test start and stop both locally and remotely. Test emergency stop.									Records results
	Test the overloads operation and effectiveness.									Use the space provided

This test report does not negate the requirement of testing for ESC or COC compliance by a registered person.

Calculations and notes for thermal overload and timer settings; Other observations

Motor Circuits

Develop diagrams/drawings of main circuit and controls circuit.

Nameplate interpretation

Type of Motor:		**Test Instruments used (please list):**		
Values	Voltage from nameplate	Current from nameplate	r.p.m. from nameplate	p.f. from nameplate

Measured values (Initial direction of rotation)

Values	Measured Voltage	Measured Current	Measured r.p.m.	Calculated/measured p.f.
Report on compared values and findings:	How did this compare with the expected results, are they higher or lower, does that impact on efficiency, is it an indication of a problem with the motor or circuit?			

Motor performance

Did the motor work safely and perform as expected? If No, state why, and what was diagnosed as the fault(s)

Part 2 – Connect and test induction motor soft starters (Speed Controllers)

You must demonstrate that you can follow manufacturer's specifications and installation instructions to connect and test **three-phase induction motors and soft starters,** fittings and associated accessories to a supply; test fittings, connections and components for safe operation and compliance; and document the test results.

Complete the test sheets. Record details from the nameplate. Record any tests completed (as appropriate or relevant). If a test is not relevant, leave that test blank. You must comment on whether the actual results were comparable to expected results – if not, explain why.

2.1 Install and connect a VSD starter to a three phase induction motor for clockwise rotation (ER4+5).

Type of motor:	Small three phase motor (0.37kW) Three phase VSD	Accessories (please list):	Protective devices, Fuses, Start buttons, Stop buttons, Emergency stop, Auto/Manual and Fwd/Rev switches.
Test equipment:	Insulation resistance tester, multi-meter, controlled load (dynamometer), tachometer, power logger (tester) (if available), power meter (capable of recording inrush values), potentiometer (nominally 1KΩ		

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Connect the motor and the VSD starter with remote start and stop station and emergency stop									State whether two-wire or three-wire remote station
	Check circuit connections and for safety. Remember there is an electronic device in circuit									

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Connect the mains supply observing safety procedures									
	Energise circuit and motor Record voltage, current, rpm, and direction of rotation									State direction of rotation
	Set up the VSD parameters as required for the application and motor.									
	Test start and stop both locally and remotely. Test emergency stop. Make sure that motor reaches operating speed									Records results. Record time taken to reach desired speed.
	Stop the motor									Record time taken to decelerate and stop

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Re-start the motor, and adjust the acceleration and deceleration settings									Record new results
	Reconfigure the VSD for reverse motor operation									State direction of rotation

This test report does not negate the requirement of testing for ESC or COC compliance by a registered person.

Notes for thermal overload and timing settings; Other observations; Calculations

Motor Circuits

Develop diagrams/drawings of main circuit and VSD including remote control.

Nameplate interpretation

Type of Motor:		**Test Instruments used (please list):**		
Values	Voltage from nameplate	Current from nameplate	r.p.m. from nameplate	p.f. from nameplate

Measured values (Initial direction of rotation)

Values	Measured Voltage	Measured Current	Measured r.p.m.	Calculated/measured p.f.
Report on compared values and findings:	How did this compare with the expected results, are they higher or lower, does that impact on efficiency, is it an indication of a problem with the motor or circuit?			

Motor performance

Did the motor work safely and perform as expected? If No, state why, and what was diagnosed as the fault(s)

2.2 Install and connect electronic speed control to a single-phase motor for clockwise rotation (ER4+5).

Type of motor:	Small universal motor Single phase electronic speed controller	Accessories (please list):	Protective device, Fuse
Test equipment:	Insulation resistance tester, multi-meter, controlled load (dynamometer), tachometer, power logger (tester) (if available), power meter (capable of recording inrush values)		

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Connect the motor and the electronic starter. Remember to apply a load to the universal motor									
	Set up any additional timers as required to their correct value for this application									Record timers and settings
	Check circuit connections and for safety. Remember there is an electronic device in circuit									
	Connect the mains supply observing safety procedures									

TEST	Circuit	Visual inspection ✓	Protective device		Earth continuity (Ω)	Insulation resistance (MΩ) (actual)	Polarity ✓	Correct circuit connections ✓	Earth loop Impedance (Ω)	Notes You may write over the print below
			Rating (amps)	Type						
	Energise circuit and motor Record voltage, current.									Record voltage and current
	Set up the ESC parameters as required for the application and motor.									
	Start motor. Record r.p.m. and rotation. Make sure that motor reaches operating speed									Record r.p.m. and direction of rotation. Record time taken to reach desired speed.
	Test start and stop both locally and remotely. Test emergency stop.									Records results.
	Stop the motor									
	Reconfigure the ESC for reverse motor operation									Record direction of rotation

This test report does not negate the requirement of testing for ESC or COC compliance by a registered person.

Notes for thermal overload and timing settings; Other observations; Calculations

Motor Circuits

Develop diagrams/drawings of main circuit and ESC including remote ES.

Nameplate interpretation

Type of Motor:		**Test Instruments used (please list):**		
Values	Voltage from nameplate	Current from nameplate	r.p.m. from nameplate	p.f. from nameplate

Measured values (Initial direction of rotation)

Values	Measured Voltage	Measured Current	Measured r.p.m.	Calculated/measured p.f.
Report on compared values and findings:	How did this compare with the expected results, are they higher or lower, does that impact on efficiency, is it an indication of a problem with the motor or circuit?			

Motor performance

Did the motor work safely and perform as expected? If No, state why, and what was diagnosed as the fault(s)

Install and connect electrical motors and speed controllers Assessor/Tutor observation checklist & sign off

I confirm that the trainee:	Tick
Demonstrated safe and correct working practices when carrying out the work	☐
Followed manufacturers' specifications and installation instructions.	☐
Installed and connected for each different starter, and speed controller.	☐
Installed different accessories as appropriate and requested.	☐
Tested fittings, connections and components for safety and operation (as appropriate).	☐
Documented test results.	☐
Compared test results with expected results.	☐
Completed compliance documents	☐

Assessor/Tutor sign		Date	

Written feedback from Assessor/Tutor

ELECTRICAL CERTIFICATE OF COMPLIANCE & ELECTRICAL SAFETY CERTIFICATE

REFERENCE/CERTIFICATE ID NO.:

This form has been designed to be used by licensed electrical workers to certify that installations or Part installations under **Part 1 or Part 2 of AS/NZS 3000** are safe to be connected to the **specified** system of electrical supply.

Location Details:

Contact Details:
(Name and address)

Name of Electrical worker:

Registration/Practising licence number:

Phone & email:

Name and registration number of person(s) supervised:

Certificate of Compliance

Type of work: ☐ Addition ☐ Alteration ☐ New work

The prescribed electrical work is: ☐ Low risk ☐ General ☐ High risk (Specify):

Means of compliance: ☐ Part 1 of AS/NZS 3000 ☐ Part 2 of AS/NZS 3000

Additional Standards or electrical code of practice were required: ☐ No ☐ Yes (specify):

Date or range of dates that prescribed electrical work undertaken:

Contains fittings that are safe to connect to a power supply? ☐ Yes ☐ No

Specify type of supply system:

The installation has an earthing system that is correctly rated (where applicable) ☐ Yes ☐ No

Parts of the installation to which this certificate relates that are safe to connect to a power supply?

☐ All ☐ Parts (specify)

The work relies on manufacturers instructions: ☐ Yes ☐ No

If yes – identify the instruction manual including name, date and version. Also attach a copy of manufacturer's instructions to this certificate.
(Or provide reference to readily accessible electronic format, eg Internet link.)

Identify:
Link:

The work has been done in accordance with a certified design: ☐ Yes ☐ No

If yes – identify the certified design including name, date and version. Also attach a copy of the certified design to this certificate.
(Or provide reference to readily accessible electronic format, eg Internet link.)

Identify:
Link:

The work relies on a Supplier Declaration of Conformity (SDoC): ☐ Yes ☐ No

If yes - identify the SDoC including name, date and version OR EESS registration. Also attach a copy of the SDoC to this certificate.
(Or provide reference to readily accessible electronic format, eg Internet link.)

Identify:
Link:

The installation has been satisfactorily tested in accordance with the Electricity (Safety) Regulations 2010 ☐ No ☐ Yes

Description of Work:

Test Results (provide values)	
Polarity (Independent earth):	
Insulation resistance:	Ohms
Earth Continuity:	Ohms
Bonding:	Ohms
Fault Loop impedance	Ohms
Other (specify):	

By signing this document I certify that the completed prescribed electrical work to which this Certificate of Compliance applies has been done lawfully and safely, and the information in the certificate is correct.

Certifier's signature: **Date:**

Electrical Safety Certificate

By signing this document I certify that the installation, or part of the installation, to which this Electrical Safety Certificate applies is connected to a power supply and is safe to use.

Certifier's name:

Registration/Practising licence number:

Certifier's signature:

Certificate Issue Date:

Connection Date:

CUSTOMER COPY – THIS IS AN IMPORTANT DOCUMENT AND SHOULD BE RETAINED FOR A MINIMUM OF 7 YEARS

This Electrical Safety Certificate also confirms that the electrical work complies with the building code for the purposes of Section 19(1)(e) of the Building Act 2004.

Trainee sign off

Sign before giving this assessment and evidence to your assessor

Trainee name:	Te Pūkenga Trainee Number: NSN (if known):

Declaration:

I have completed all activities in the assessment.

I confirm that this assessment is my own work.

I understand that there is an appeals process if I am not happy with the assessment decision.

Signature:	Date:

Assessor to complete & sign

New Zealand Certificate in Electrical Engineering Theory and Practice (Trade) (Level 4)

29444 v2 - Demonstrate and apply knowledge of AC electric motor control and installation. (Level 4, Credits 5)

Part	Attempt 1		Attempt 2		Attempt 3		Notes
	C	NYC	C	NYC	C	NYC	
1.1	☐	☐	☐	☐	☐	☐	
1.2	☐	☐	☐	☐	☐	☐	
2.1	☐	☐	☐	☐	☐	☐	
2.2	☐	☐	☐	☐	☐	☐	

Assessor's feedback to trainee

I confirm that the trainee has completed this assessment. The work shows a level of competence that is appropriate for the unit standard.

Assessor name: Assessor number:

Signature: Date:

Email:

Te Pūkenga

earnlearn-tepukenga.ac.nz

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