

Unit ID: 1228

Domain

**ELECTRICAL INSTALLATION**

Title:

**Demonstrate knowledge of alternating current (AC) machines**

Level: 3

Credits: 6

### Purpose

This unit standard is intended for those who apply knowledge of alternating current (AC) machines. People credited with this unit standard are able to demonstrate knowledge of single-phase machines; demonstrate knowledge of three phase machines; demonstrate knowledge of three phase motor starting; and demonstrate knowledge of motor speed control.

This unit standard is intended for those who work as electricians.

### Special Notes

1. Entry information:

Prerequisite

- *none*

2. This unit standard is to be delivered and assessed in the context of electrical operations and should be assessed in conjunction with other relevant technical units selected from this domain.

3. To demonstrate competence, at a minimum, evidence is required from correct explanations of operating principles of single-phase motors and three phase motors, knowledge of motor starters and knowledge of speed control circuit laws and theorems as well as performing calculations applying these laws

4. Assessment evidence may be collected from a real workplace or a simulated workplace environment in which electrical operations are carried out.

5. Glossary of terms:

- '*AC machines*' refer Alternating Current machines.

### Quality Assurance Requirements

This unit standard and others within this subfield may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority on [www.namqa.org](http://www.namqa.org) and the Namibia Training Authority on [www.nta.com.na](http://www.nta.com.na).

## **Elements and Performance Criteria**

### **Element 1: Demonstrate knowledge of single-phase machines**

Single phase motors including but not limited to universal motor, single phase synchronous motor and split phase

#### **Performance Criteria**

- 1.1 Effect on a conductor moving across a magnetic field is explained.
- 1.2 Effect of a conductor carrying current in a magnetic field is explained.
- 1.3 Principle of inducing an electromotive force is explained.
- 1.4 Principles of a rotating magnetic field in a single-phase motor are explained
- 1.5 Different types of single-phase generators including separately excited and self-excited generators are explained with their output characteristics
- 1.6 Characteristics of single-phase motors are explained.

### **Element 2: Demonstrate knowledge of three phase machines**

#### **Range**

Different types of three phase motors including but are not limited to squirrel cage induction motor, wound rotor motor.

#### **Performance Criteria**

- 2.1 Output wave forms from a three-phase generator are explained.
- 2.2 Principle of torque production and slip on a three-phase motor is explained.
- 2.3 Different types of three phase motors and synchronous motor are listed and their advantages and disadvantages explained.
- 2.4 Speed, generated voltage and load current of different types of three phase generators are explained.
- 2.5 Speed and Torque characteristics of different three phase motors are explained
- 2.6 Calculations on load characteristics on three phase generators are conducted.
- 2.7 Calculations on three phase motors, including and not limited to line current, phase current, speed and torque are conducted.

### **Element 3: Demonstrate knowledge of three phase motor starting**

#### **Range**

Three phase motors including and not limited to direct on line, start delta, auto transformer and rotor resistance

#### **Performance Criteria**

3.1 Different starting methods of three phase motors are explained.

### **Element 4: Demonstrate knowledge of motor speed control**

#### **Performance Criteria**

4.1 Principles of speed control on motors are explained.

4.2 Methods of speed control are identified and their advantages and disadvantages are explained.

4.3 Calculations on motor speed and torque for different motors are carried out.

### **Registration Data**

<b>Subfield:</b>	Electrical Engineering
<b>Date first registered:</b>	24 July 2014
<b>Date this version registered:</b>	23 November 2023
<b>Anticipated review:</b>	23 November 2028
<b>Body responsible for review:</b>	Namibia Training Authority