

Domain

**ELECTRONICS**

Title: **Apply knowledge of combinational digital electronic circuits**

Level: 2

Credits: 10

**Purpose**

This unit standard specifies the competencies required to demonstrate and apply knowledge of combinational digital electronic circuits. It include, Measure parameters in combinational digital electronic circuits, Sketch logic gate symbols and combinational logic circuit diagrams, Analyse combinational digital electronic circuits, Simulate combinational digital electronic circuits, demonstrate knowledge of logic gates and combinational digital electronic circuits. This unit standard is intended for electronics technicians or artisans.

**Special Notes**

## 1. Entry information

Prerequisite

- *Unit 1157 - Demonstrate basic knowledge of workplace health and safety*
- *Unit I&C02 - Plan and organise work in electronic work environment*

2. Assessment evidence may be collected from a real workplace or an appropriate simulated realistic environment in which electronic operations are carried out.

3. To demonstrate competence, minimum evidence of knowledge of logic gates and combinational digital electronic circuits, sketching of logic gate symbols and combinational logic circuit diagrams, analysis of combinational digital electronic circuits, simulation of combinational digital electronic circuits and measurement of parameters in combinational digital electronic circuits (at least 50 percent of all areas in the element) is required.

4. All circuit analyses methods include calculations, measurements and simulations.

5. Glossary of terms:

- IEC 60617-This standard is issued by the **International Electro-technical Commission** and this standard for electrical components symbols.
- IEEE- Institute of Electrical and Electronics Engineers.

6. Regulations and legislation relevant to this unit standard include the following:

- Labour Act, No. 11, 2007.
- Regulations relating to the Health and Safety of employees at work, 1997
- Occupational Health and Safety Regulations No. 18, 1997 and all subsequent amendments.

7. Performance of all elements in this unit standard must comply with industry standards.

## **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 and the Namibia Training Authority on [www.nta.com.na](http://www.nta.com.na).

## **Elements and Performance Criteria**

### **Element 1: Demonstrate knowledge of logic gates and combinational digital electronic circuits**

#### **Range**

Logic gates include, AND, OR, NOT, NOR, NAND, EX-OR, and EX-NOR.  
Combinational digital electronic circuits include, encoders, decoders, adders, subtractors, comparators, multiplexers and de-multiplexers.

#### **Performance Criteria**

- 1.1 The symbol, truth table, and equivalent Boolean expression are stated for logic gates.
- 1.2 Logic gates are identified by their standard symbols, truth tables and/or inspection.
- 1.3 A logic gate diagram is described for a given simple truth table and simple written statement.
- 1.4 Pin layout for combinational logic ICs are identified from datasheets and/or by inspection.
- 1.5 Operation of combinational logic ICs is determined by measurement, truth table and/or datasheets.

### **Element 2: Sketch logic gate symbols and combinational logic circuit diagrams**

#### **Range**

Logic gates include AND, OR, NOT, NOR, NAND, EX-OR, and EX-NOR.  
Combinational digital electronic circuits include encoders, decoders, adders, subtractors, comparators, multiplexers and de-multiplexers.

#### **Performance Criteria**

- 2.1 Logic gates symbols used in circuit diagrams are in accordance with the IEC/IEEE standards.
- 2.2 Logic gates are connected to represent a given combinational circuit.
- 2.3 Timing diagrams are drawn from combination of logic gates and explained in terms of their state at different intervals.
- 2.4 Circuit diagrams are labelled with values in accordance with the IEC/IEEE standards.

2.5 Circuit diagrams are captioned according to workplace standards.

### **Element 3: Analyse combinational digital electronic circuits**

#### **Range**

Combinational digital electronic circuits include, encoders, decoders, adders, subtractors, comparators, multiplexers and de-multiplexers. Different number base include but are not limited to binary, octal, hexadecimal and decimal numbers and not limited to whole numbers.

#### **Performance Criteria**

- 3.1 Numerical results are presented using different number systems.
- 3.2 Types of different digital circuits are identified.
- 3.3 Calculations are performed using different number bases.
- 3.4 Truth table is used to describe the logic operators.
- 3.5 Logic gates are used to perform logic operations.
- 3.6 Truth table are drawn from combination of logic gates to simplify the combination circuits.
- 3.7 Logic expressions are simplified using Boolean algebra, De Morgan's theorem and Karnaugh maps.
- 3.8 Logic functions are employed using universal gates (NAND, NOR).
- 3.9 Different combinational digital electronic circuits are analysed according to job requirements.

### **Element 4: Simulate combinational digital electronic circuits**

#### **Range**

Digital electronics components and circuits to be simulated include logic gates.

#### **Performance Criteria**

- 3.1 Digital electronic circuits are captured in simulation software.
- 3.2 Appropriate virtual instruments are used for measuring.
- 3.3 Simulation results are recorded with appropriate SI units.
- 3.4 Simulation results are compared with the expected results.

## **Element 5: Measure parameters in combinational digital electronic circuits**

### **Range**

Parameters to be measured include voltage levels, voltage wave forms. Digital electronics components and circuits to be measured include logic gates.

### **Performance Criteria**

- 4.1 Appropriate instruments are used for measuring parameters.
- 4.2 Electrostatic devices are handled according to manual or manufactures' recommendation.
- 4.3 Digital electronic circuits are built on breadboard.
- 4.4 Voltage levels are measured.
- 4.5 Different wave forms and logic outputs are recorded and interpreted.

### **Registration Data**

<b>Subfield:</b>	Electrical Engineering
<b>Date first registered:</b>	
<b>Date this version registered:</b>	
<b>Anticipated review:</b>	
<b>Body responsible for review:</b>	Namibia Training Authority