

**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**MOTOR VEHICLE ELECTRICIAN**

**KNQF LEVEL 3**

**PROGRAMME CODE: 0716254A**

# FOREWORD

The provision of quality education and training is fundamental to the government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya 2010 and this resulted in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training.

This policy document requires that training in TVET institutions be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery to allow for multiple entry and exit in TVET programmes. These reforms demand that industry takes a leading role in occupational standards development to ensure it addresses competence needs.

It is against this background that these Occupational Standards have been developed for a competency-based Automotive Engineering standard. These Occupational Standards will also be the basis for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a key role towards development of competent human resource for the engineering sector’s growth and development.

# PREFACE

Kenya Vision 2030 aims to transform the country into “a newly industrializing, middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace competency-based education and training (CBET).

The Technical and Vocational Education and Training (TVET) Act No. 29 of 2013 and Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

Incumbent Automotive engineering industry experts in conjunction with expert subject trainers and other related stakeholders have developed these Occupational Standards for Motor vehicle electrician Level 3. These standards will be the basis for development of competency-based curriculum for Motor vehicle electrician Level 3

The Occupational Standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to everyone who participated in the development of these Occupational Standards.

**ACRONYMS**

RAM Random Access Memory

CPU Central processing Unit

HDMI High-Definition multimedia interface

ICT Information and communication technology

USB Universal Serial Bus

**KEY TO UNIT CODE**



TABLE OF CONTENTS

[FOREWORD i](#_Toc196896052)

[PREFACE ii](#_Toc196896053)

[OVERVIEW vi](#_Toc196896054)

[CORE UNITS OF COMPETENCY 1](#_Toc196896055)

[SERVICE VEHICLE STARTING SYSTEMS 2](#_Toc196896056)

[MAINTAIN VEHICLE CHARGING SYSTEM 7](#_Toc196896057)

[MAINTAIN VEHICLE LIGHTING SYSTEM 12](#_Toc196896058)

# OVERVIEW

The Motor Vehicle Electrician Level 3 qualification consists of competencies that a person must achieve to enable him/her to service and maintain vehicle electrical systems. It includes servicing vehicle starting systems, maintaining vehicle charging system and maintaining vehicle lighting system

The units of competency comprising motor vehicle electrician certificate level 3 qualification include the following competencies:

**SUMMARY OF UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| 0716 251 01A | Service vehicle starting systems |
| 0716 251 02A | Maintain vehicle charging system |
| 0716 251 03A | Maintain vehicle lighting system |

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# CORE UNITS OF COMPETENCY

# SERVICE VEHICLE STARTING SYSTEMS

**UNIT CODE: 0716 251 01A**

**UNIT DESCRIPTION**

This unit specifies competencies required to service vehicle starting system. It involves repairing starting system, servicing ignition system, testing ignition system and performing housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements  ***(Bold and italicized terms are elaborated in the range)*** |
| 1. Apply basic concepts of electrical quantities | * 1. ***SI unit***s in Electrical are identified in accordance with IEE regulations.   2. ***Quantitie***s of Charge, force, work and power are defined as per engineering principles   3. Perform calculations involving Ohm’s law i.e. Current, Resistance and voltage   4. measuring instruments for electrical quantities are identified in accordance with engineering principles |
| 1. Motor vehicle Battery Service | 1. Understanding of electrolysis and its applications is demonstrated 2. Simple cells are constructed 3. Primary and secondary cells are differentiated 4. Types of cells and batteries are identified 5. ***Maintenance*** of batteries is carried out 6. Applications of batteries are identified |
| 1. Starting System repair | 1. Work area is organized and safety measures undertaken as per workplace procedure. 2. Tools, equipment and materials are assembled as per work requirements. 3. Physical checks and tests are performed as per service manual 4. Starting system components are serviced according to manufacturer’s manual 5. Starting system is assembled according to manufacturer’s specification 6. Starting system is tested according to manufacturer’s specification |
| 1. Perform house keeping | 1. Waste is segregated and disposed as per workshop procedure 2. Tools and equipment are cleaned as per workshop procedure 3. Tools and equipment are stored as per workshop procedure 4. Work area is cleaned according to workplace requirements |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Tools and equipment may include but not limited to: | * 1. General workshop equipped for servicing vehicle electrical systems; * Screw driver * Ratchet and socket set * Wrench   1.2 Electronic diagnostic equipment;   * Multi-meters * Ignition test equipment. * Hydrometer * High-rate discharge tester * Feeler gauge * Battery charger * Glower * Test lamp |
| 1. Physical checks and tests may include but not limited to: | * Battery Terminals * Battery Cables * Starter Motor * Ignition switch * Wiring connections |
| 1. Starting system components may include but not limited to: | * Starter motor * Solenoid * Ignition switch * Battery |
| 1. Ignition system components may include but not limited to: | * Battery * Spark plug * Distributors * Ignition coil * High tension cables |

**REQUIRED KNOWLEDGE AND SKILLS**

This section describes the knowledge and skills required for this unit of competency.

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Using sources of technical information for electrical systems
* Circuit protection
* Electrical safety procedures
* Electrical and electronic control system
* Selecting and using sealants, seals, fittings and fasteners
* Using of appropriate test methods
* Electrical principles
* Vehicle wiring principles
* Operation and construction of vehicle electrical systems
* Electrical safety procedures.

**Required skills**

The individual needs to demonstrate the following skills: ;

* Time management
* Problem solving
* Communications
* Planning
* Decision making
* First aid
* Analytical
* Starting system repair
* Ignition system service
* Ignition system test

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and skills range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   1. Undertook safety measures as per workplace procedure. 2. Selected tools, equipment and materials as per work requirements 3. Performedphysical checks and tests as per service manual 4. Serviced starting system components according manufacturers guidelines 5. Repaired ignition system components according manufacturers guidelines 6. Tested ignition system according to the manufacturers specification 7. Performed housekeeping as per workplace procedure |
| 1. Resource implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place 3. Resources relevant to the proposed assessment activity or tasks. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Portfolio of evidence   3. Third party report   4. Written tests |
| 1. Context of assessment | Competency may be assessed in a workplace or in a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

# MAINTAIN VEHICLE CHARGING SYSTEM

**UNIT CODE: 0716 251 02A**

**UNIT DESCRIPTION**

This unit specifies competences required to maintain vehicle charging system. It involves inspecting charging system, servicing charging system, testing vehicle charging system and performing workshop housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements  ***(Bold and italicized terms are elaborated in the range)*** |
| 1. Apply Workshop Safety | 1. Safe work environment is maintained as per workplace requirements 2. ***Workplace hazards*** and risks are controlled as per workplace requirements    1. ***Workplace accidents*** and incidents are managed as per workplace requirements |
| 1. Inspect charging system | * 1. PPE’s are adorned as per workshop procedure.   2. Work area is organized and safety measures undertaken as per workplace procedure.   3. ***Tools, equipment and materials*** are assembled as per work requirements.   4. ***Vehicle charging system*** is assessed as per manufacturer’s manual. |
| 1. Service vehicle charging system | * 1. Safety precautions are taken as per work requirements   2. Tools and equipment are selected as per job requirement   3. Physical checks and tests are performed as per service manual   4. Charging system is dismantled according manufacturers manual   5. Charging system is repaired according to manufacturer’s manual   6. Charging system is assembled according to manufacturer’s specification |
| 1. Test vehicle charging system | * 1. Work area is organized and safety measures undertaken as per workplace procedure.   2. Tools, equipment and materials are assembled as per work requirements.   3. Charging system is assessed according to the manufacturer’s specification |
| 1. Perform house keeping | * 1. Waste is segregated and disposed as per workshop procedure   2. Tools and equipment are cleaned as per workshop procedure   3. Tools and equipment are stored as per workshop procedure   4. Work area is cleaned according to workplace requirements |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Tools, equipment and materials may include but not limited to: | * Multimeter * Battery charger * Spanners * Hydrometer * Screw driver * High-Rate discharge tester |
| 1. Vehicle charging system inspection may include but not limited to: | * Battery Condition * Terminal * Drive Belt * Alternator * Wiring |
| 1. Charging system may include but not limited to: | * Alternator * Battery * Battery cables * Fuses |

**REQUIRED KNOWLEDGE AND SKILLS**

This section describes the knowledge and skills required for this unit of competency.

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Use sources of technical information for electrical systems
* Circuit protection
* Electrical safety procedures
* Selecting and using sealants, seals, fittings and fasteners
* Using appropriate test methods
* Basic electrical principles
* Vehicle wiring principles
* Operation and construction of vehicle electrical systems
* Electrical safety procedures

**Required skills**

The individual needs to demonstrate the following skills:

* Time management
* Problem solving
* Communications
* Planning
* Decision making
* First aid
* Charging system inspection
* Vehicle charging system service
* Vehicle charging system test

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and skills range.

|  |  |
| --- | --- |
| 1. Critical aspects of competency | ***Assessment requires evidence that the candidate:***   1. Adorned PPE’s as per workshop procedures. 2. Assembled tools, equipment and materials as per work requirements. 3. Carried out vehicle charging system inspection as per manufacturer’s manual. 4. Performed physical checks and tests as per service manual 5. Repaired charging system according to manufacturer’s manual 6. Assessed charging system according to the manufacturer’s specification 7. Cleaned work area according to workplace requirements |
| 1. Resource implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place 3. Resources relevant to the proposed assessment activity or tasks. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Project   3. Portfolio of evidence   4. Third party report   5. Written tests |
| 1. Context of assessment | Competency may be assessed in a workplace or in a simulated workplace |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

# MAINTAIN VEHICLE LIGHTING SYSTEM

**UNIT CODE: 0716 251 03A**

**UNIT DESCRIPTION**

This unit specifies competences required to maintain vehicle charging system. It involves inspecting lighting system, servicing lighting system, testing vehicle lighting system and performing workshop housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace functions | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements  ***(Bold and italicized terms are elaborated in the range)*** |
| 1. Inspect lighting system | 1. PPE’s are adorned as per workshop procedure. 2. Work area is organized and safety measures undertaken as per workplace procedure. 3. ***Tools, equipment and materials*** are selected as per work requirements. 4. ***Physical checks and tests*** are performed as per manufacturer’s manual |
| 1. Service vehicle lighting system | 1. Safety precautions are observed as per manufacturer’s manual 2. Tools and equipment are selected as per job requirement 3. ***Lighting system* components** are identified as per manufacturer’s manual 4. Lighting system is diagnosed according to manufacturer’s manual 5. Circuits are repaired according to manufacturer’s specification |
| 1. Test vehicle lighting system | 1. Work area is organized and safety measures undertaken as per workplace procedure. 2. Tools, equipment and materials are assembled as per work requirements. 3. Lighting system is assessed according to manufacturer’s specification |
| 1. Perform house keeping | 1. Waste is segregated and disposed as per workshop procedures 2. Tools and equipment are cleaned as per workshop procedures 3. Tools and equipment are stored as per workshop procedures 4. Work area is cleaned according to workplace requirements |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Tools, equipment and materials may include but not limited to: | * Multimeter * Circuit tester * Screw drivers and wrenches * Socket set * Clipping tools * Electrical Tapes * Wire Brush |
| 1. Physical checks and tests may include but not limited to: | * Cracks, damage or moisture * Bulbs * Wiring |
| 1. lighting system components may include but not limited to: | * Lamps * Light fixtures * Sensors * Switches * Flasher unit * Relays |

**REQUIRED KNOWLEDGE AND SKILLS**

This section describes the knowledge and skills required for this unit of competency.

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Technical information for electrical systems
* Circuit protection
* Electrical safety procedures
* Selecting and using sealants, seals, fittings and fasteners
* Using appropriate test methods
* Electrical principles
* Vehicle wiring principles
* Operation and construction of vehicle electrical systems
* Electrical safety procedures

**Required skills**

The individual needs to demonstrate the following skills:

* Time management
* Problem solving
* Communication
* Planning
* Decision making
* First aid

(Include technical skills)

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and skills range.

|  |  |
| --- | --- |
| Critical aspects of competency | ***Assessment requires evidence that the candidate:***   1. Organized work area and undertook safety measures as per workplace procedure. 2. Selectedtools, equipment and materials as per work requirements. 3. Performedphysical checks and tests as per manufacturer’s manual 4. Repaired circuits according to manufacturer’s specification 5. Assessed lighting system according to manufacturer’s specification |
| Resource implications | The following resources should be provided:   1. Access to relevant workplace where assessment can take place 2. Appropriately simulated environment where assessment can take place 3. Resources relevant to the proposed assessment activity or tasks. |
| Methods of Assessment | Competency in this unit may be assessed through:   * 1. Practical   2. Project   3. Portfolio of evidence   4. Third party report   5. Written tests |
| Context of Assessment | Competency may be assessed in a workplace or in a simulated workplace |
| Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |