



**Australian Government**

**Assessment Requirements for AURETH016  
Diagnose and repair complex faults in  
battery electric vehicle powertrains**

**Release: 1**

# Assessment Requirements for AURETH016 Diagnose and repair complex faults in battery electric vehicle powertrains

## Modification History

Release	Comments
Release 1	This version first released with the Automotive Retail, Service and Repair Training Package Version 7.0. Newly created unit.

## Performance Evidence

The candidate must demonstrate the ability to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including evidence of the ability to:

- safely depower a battery electric vehicle (BEV) in each of the following charging systems:
  - BEV with an AC charging system
  - BEV with a DC charging system
- diagnose at least one complex fault in a powertrain for the above
- carry out repair of faults identified from diagnostic tests during the above for at least one of the following faults:
  - insulation faults in high voltage (HV) cables of the traction motor
  - HV component faults
  - low voltage (LV) interlock fault
  - traction motor noise fault
  - traction motor sensor fault

## Knowledge Evidence

The candidate must be able to demonstrate knowledge to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including knowledge of:

- methods to locate and interpret information required to diagnose and repair vehicle complex faults in BEV powertrains, including:
  - manufacturer specific procedures
  - Australian Standards (AS) 5732 Electric vehicle operations - Maintenance and repair
- workplace procedures and work health and safety (WHS) requirements relating to diagnosing and repairing BEV powertrains, including:
  - documentation procedures
  - housekeeping procedures, including:

- examination and storage of tools and equipment
- identification, tagging and isolation of faulty equipment
- safe disposal and recycling of materials
- using personal protective equipment (PPE)
- using of fire safety equipment
- identifying hazards and controlling risks associated with:
  - working on vehicle high voltages on vehicle electrical systems
  - wearing jewellery while working around high current wiring systems
- safe manual handling techniques, including those for lifting and moving high voltage (HV) rechargeable energy storage systems
- procedures for minimising risks associated with hazards, including applying electrical safety precautions when:
  - using personal protective equipment (PPE), including electrical safety gloves with 1000 volt rating and Australian standards rated HV insulating mat
  - identifying and using firefighting equipment
  - using the one hand rule
  - following live system warning tags and signs
  - depowering vehicle
  - isolating HV Rechargeable Energy Storage System (RESS) electrical supply
  - stabilising vehicle electrical system
- operating principles of BEV components, including:
  - AC power
  - induction motors
  - driver invertors
  - AC/DC and DC/DC power conversion
  - AC and DC charging systems
  - electric braking systems
  - HV battery components and architecture, including state of charge (SOC) and internal component monitoring
  - HV battery management systems
  - HV battery discharge procedures
  - HV system precharge concepts
  - driver assist systems for BEVs
  - infotainment systems in BEV
  - safety interlocks
  - short circuit monitoring
  - open circuit monitoring
  - onboard charging and communication protocols
- diagnostic testing procedures for high voltage traction motors in BEVs, including procedures for:
  - accessing and interpreting scan tool system data, including:

- diagnostic trouble codes (DTCs)
- live data
- freeze frame data
- using diagnostic flow charts
- testing the electrical system, including:
  - accessing electrical terminals and using test probes without damaging connectors, fuse holders or wiring
  - determining damage to traction motor
    - windings
  - checking insulation resistance of traction motor windings
  - checking routing and damage to HV cabling
  - conducting vehicle dynamic and static tests
  - analysing abnormal noise
  - analysing component failure
- repair procedures for battery electric vehicle powertrains, including:
  - removing and replacing damaged components
  - removing and replacing the powertrain
- post repair procedures for battery electric vehicle powertrains, including:
  - DTC clearing procedures
  - checking for electrical connector mating static and dynamic performance tests of powertrains.

## Assessment Conditions

Competency is to be assessed in the workplace or a simulated environment that accurately reflects performance in a real workplace setting.

Assessment must include direct observation of tasks.

Where assessment of competency includes third-party evidence, individuals must provide evidence that links them to the diagnosis and repair of complex faults in battery electric vehicle powertrains, e.g. repair orders.

Assessors must verify performance evidence through questioning on skills and knowledge to ensure correct interpretation and application.

The following resources must be made available:

- workplace instructions
- PPE, including electrical safety gloves with 1000 volt rating and Australian standards rated HV insulating mat.
- AS 5732 Electric vehicle operations: Maintenance and repair
- manufacturer battery electric vehicle powertrain specifications
- BEVs with an AC and DC charging system and one complex powertrain fault in each BEV
- battery electric vehicle powertrain diagnostic equipment, including:

- digital multimeter with CAT III 1000 volt rating
- insulation tester
- scan tool
- oscilloscope
- residual voltage tester, if specified in original equipment manufacturer (OEM) test requirements
- tools, equipment and materials appropriate for diagnosing complex faults in battery electric vehicle powertrains

Assessors of this unit must satisfy the requirements for assessors in applicable vocational education and training legislation, frameworks and/or standards.

## **Links**

Companion Volume Implementation Guide is found on VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b4278d82-d487-4070-a8c4-78045ec695b1>