IMIAEMEI04

Diagnose and rectify motor vehicle drivetrain electrical faults

Overview

This standard is about diagnosing and rectifying electrical faults occurring within the vehicle drivetrain area.

Performance criteria

You must be able to:

- P1 select and use appropriate personal and vehicle protection equipment at all times
- P2 support the identification of electrical faults, by reviewing vehicle:
  - P2.1 technical data
  - P2.2 diagnostic test procedures
- P3 select and prepare for use the appropriate required electrical and electronic testing equipment and follow manufacturers' instructions prior to use
- P4 use electrical and electronic testing techniques which are relevant to the symptoms presented
- P5 collect sufficient diagnostic information in a systematic way to enable an accurate diagnosis of electrical system faults
- P6 identify and record any system deviation from acceptable limits accurately
- P7 make cost effective recommendations for rectification based upon your analysis of the diagnostic information gained
- P8 use all tools and equipment required for your diagnostic and rectification activities, correctly and safely throughout
- P9 carry out all diagnostic & rectification activities following:
  - P9.1 manufacturers' procedures
  - P9.2 health and safety requirements
- P10 work in a way which minimises the risk of:
  - P10.1 damage to other vehicle systems, units and components
  - P10.2 contact with leakage, hazardous substances and high voltage systems
  - P10.3 damage to your working environment
  - P10.4 injury to yourself and others
- P11 ensure all repaired and replaced electrical components and units conform to the vehicle operating specification and any legal requirements
- P12 adjust components and units correctly to ensure that they operate to meet system requirements, when necessary
- P13 ensure the electrical system rectified performs to the vehicle operating specification and any legal requirements prior to handover to the customer

P14 ensure your records are accurate, complete and promptly passed to the relevant person(s) in the format required

P15 complete all diagnostic and rectification activities within the agreed timescale

P16 promptly report any anticipated delays in completion to the relevant person(s)

Knowledge and understanding

You need to know and understand:

Legislative and organisational requirements and procedures

K1 the current health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when diagnosing and rectifying electrical faults

K2 statutory legal requirements relating to the vehicle and components fitted

K3 your workplace procedures for:

- K3.1 recording fault location and any necessary repair work
- K3.2 reporting the results of tests (internally and externally as appropriate)
- K3.3 the referral of problems
- K3.4 reporting delays to the completion of work

K4 the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed

K5 the importance of documenting diagnostic and rectification information

K6 the importance of working to agreed timescales and keeping others informed of progress

K7 the relationship between time, costs and profitability

K8 the importance of promptly reporting anticipated delays to the relevant person(s)

You need to know and understand:

Electrical and electronic principles

K9 electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism, electromagnetic induction, EMC, digital and fibre optics principles

K10 electrical symbols, units and terms

K11 electrical safety procedures

K12 how electrical and electronic units and components are constructed, dismantled and reassembled

K13 how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltages and wave forms

K14 the interaction between electrical, electronic and mechanical components within the systems defined

K15 how the drivetrain system components and circuits function

K16 how electrical systems interlink and interact, including networking protocols

You need to know and understand:

Use of electrical testing equipment

K17 how to select and prepare for use the appropriate diagnostic testing equipment

K18 how to use electrical and electronic testing equipment to correctly and safely diagnose electrical faults

You need to know and understand:

Drivetrain electrical faults, their diagnosis and correction

K19 the types and causes of drivetrain electrical system, component and unit faults and failures

K20 drivetrain electrical component and unit replacement procedures, the circumstances that will necessitate replacement and other possible courses of action

K21 how to find, interpret and use sources of information on drivetrain electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements

K22 how to carry out systematic diagnostic testing of electrical and electronic systems using electrical testing techniques

K23 how to select the most appropriate diagnostic testing method for the symptoms presented

K24 how to interpret test results and vehicle data in order to identify the location and cause of vehicle system faults

K25 how to rectify electrical and electronic faults

K26 how to check for current systems software version and updating process

K27 how to make cost effective recommendations for rectification

Scope/range

1. Electrical faults occurring within the drivetrain include:

1.1. starting and charging system
1.2. engine management systems
1.3. electronic clutch control system
1.4. electronic gearbox control system
1.5. electronic transmission control system
1.6. electric retarder systems
1.7. electronically controlled slip differential system
1.8. traction control system

2. Electrical and electronic testing equipment includes:

2.1. volt meters
2.2. ammeters
2.3. ohmmeters
2.4. multimeters
2.5. battery testing equipment
2.6. dedicated and computer based diagnostic equipment
2.7. oscilloscopes

3. Tools and equipment include:

3.1. hand tools
3.2. special purpose tools
3.3. general workshop equipment

4. Diagnostic Testing is defined as:

4.1. verify the fault
4.2. collect further information
4.3. evaluate the evidence
4.4. carry out further tests in a logical sequence
4.5. rectify the problem
4.6. check all systems

5. Electrical and electronic testing techniques include:

5.1. voltage, resistance and current measuring

5.2. frequency measuring

5.3. visual

5.4. dedicated and computer based testing

Additional information

This section contains examples and explanations of some of the terms used but does not form part of the standard.

Glossary

Agreed timescales

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Drivetrain

All component(s) from the power source(s) to the driven wheels including interconnecting control systems

Electrical faults

These are faults that require a multi stage inspection and a series of test results to identify the cause

Vehicles

These can be any of the following – light vehicles, heavy goods and passenger service vehicles, motorcycles, mopeds and scooters

Rectification activities are defined as:

A suitable repair or replacement that rectifies the fault(s) identified from the diagnostic activities carried out

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