
Overview

This standard is about diagnosing and rectifying faults occurring within light vehicle gearboxes, hubs and bearings, driveline shafts, clutches, differentials and final drive units.

Performance criteria

- You must be able to:
- P1 use suitable personal and vehicle protective equipment when using **diagnostic methods** and carrying out rectification activities
 - P2 support the identification of **faults**, by reviewing vehicle:
 - P2.1 technical data
 - P2.2 diagnostic test procedures
 - P3 prepare the vehicle systems and work area for safe working procedures as appropriate to the vehicle
 - P4 prepare, check and use all the required **equipment** following manufacturers' instructions
 - P5 use **diagnostic methods** which are relevant to the symptoms presented
 - P6 collect diagnostic information in a logical and systematic way relevant to the **diagnostic methods** used
 - P7 collect sufficient diagnostic information to enable an accurate diagnosis of transmission and driveline system **faults**
 - P8 accurately identify and record any system deviation from acceptable limits
 - P9 accurately ensure your assessment of dismantled sub-assemblies, units and components identifies their condition and suitability for repair or replacement
 - P10 promptly inform the relevant person(s) where repairs are uneconomic or unsatisfactory to perform
 - P11 carry out all diagnostic and rectification activities following:
 - P11.1 manufacturers' instructions
 - P11.2 recognised repair methods
 - P11.3 your workplace procedures
 - P11.4 health, safety and environmental requirements
 - P12 work in a way which minimises the risk of:
 - P12.1 damage to other vehicle systems
 - P12.2 damage to other units and components
 - P12.3 contact with leakages
 - P12.4 contact with hazardous substances
 - P13 ensure all repaired and replacement units and components conform to the vehicle operating specification and any legal requirements

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- P14 adjust units and components correctly, when necessary, to ensure that they operate to meet system requirements
 - P15 promptly record and report any additional **faults** you notice during the course of work
 - P16 use testing methods which are suitable for assessing the performance of the system rectified
 - P17 ensure the **transmission and driveline system** rectified performs to the vehicle operating specification and any legal requirements prior to return to the customer
 - P18 ensure your records are accurate, complete and passed to the relevant person(s) within the agreed timescale and in the format required
 - P19 complete all system diagnostic activities within the agreed timescale
 - P20 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 legislation and workplace procedures relevant to
 - K1.1 health and safety
 - K1.2 the environment (including waste disposal)
 - K1.3 appropriate personal and vehicle protective equipment
- K2 legal requirements relating to the vehicle (including road safety requirements)
- K3 your workplace procedures for:
 - K3.1 recording fault location and correction activities
 - K3.2 reporting the results of tests
 - 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)

Electrical and electronic principles

- K9 electrical and electronic principles associated with **transmission and driveline systems**, including types of sensors and actuators, their application and operation
- K10 how electrical and electronic **transmission and driveline systems** operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles
- K11 the interaction between electrical, electronic and mechanical components within vehicle **transmission and driveline systems**
- K12 how transmission and driveline electrical systems interlink and interact, including multiplexing
- K13 electrical symbols, units and terms
- K14 electrical safety procedures

K15 the hazards associated with working on or near high energy electrical vehicle components

Use of diagnostic and rectification equipment

K16 how to prepare and check the accuracy of **diagnostic testing equipment**

K17 how to use diagnostic and rectification **equipment** for transmission and driveline mechanical, electrical, hydraulic/pneumatic and fluid systems, specialist repair tools and general workshop **equipment**

Vehicle system faults, their diagnosis and correction

K18 how transmission and driveline mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems are constructed and operate

K19 how transmission and driveline mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems are dismantled, reassembled and adjusted to manufacturers' specification

K20 the types and causes of transmission and driveline mechanical, electrical, electronic, hydraulic/pneumatic and fluid system, component and unit **faults** and failures

K21 transmission and driveline mechanical, electrical, hydraulic/pneumatic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

K22 how to find, interpret and use sources of information on transmission and driveline electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements

K23 vehicle operating specifications for limits, fits and tolerances relating to transmission and driveline mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems for the vehicle(s) on which you work

K24 how to select the most appropriate **diagnostic testing** method for the symptoms presented

K25 how to carry out systematic **diagnostic testing** of transmission and driveline mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems using a prescribed process or format

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- K26 how to assess the condition evident within transmission and driveline mechanical, electrical, electronic, hydraulic/pneumatic and fluid units and components
 - K27 how to interpret test results and vehicle data in order to identify the location and cause of vehicle system **faults**
 - K28 how to carry out the rectification activities in order to correct **faults** in the transmission and driveline mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems
 - K29 the relationship between test methodology and the **faults** repaired – the use of appropriate testing methods
 - K30 how to make cost effective recommendations for rectification

Scope/range

- 1. Transmission and driveline systems** are:
 - 1.1. gearbox
 - 1.2. hubs and bearings
 - 1.3. final drive assembly
 - 1.4. driveline components
 - 1.5. clutch

- 2. Diagnostic methods** are:
 - 2.1. measurement
 - 2.2. functional testing
 - 2.3. electrical and electronic systems testing

- 3. Diagnostic testing** is defined as:
 - 3.1. verify the fault
 - 3.2. collect further information
 - 3.3. evaluate the evidence
 - 3.4. carry out further tests in a logical sequence
 - 3.5. rectify the problem
 - 3.6. check all systems

- 4. Equipment** is:
 - 4.1. diagnostic and rectification equipment for transmission mechanical systems
 - 4.2. diagnostic and rectification equipment for transmission electrical systems
 - 4.3. diagnostic and rectification equipment for transmission hydraulic/pneumatic and fluid systems
 - 4.4. specialist repair tools
 - 4.5. general workshop equipment

- 5. Faults** are:
 - 5.1. mechanical
 - 5.2. electrical and electronic
 - 5.3. hydraulic/pneumatic and fluid

**Additional
Information****Glossary**

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

Agreed timescales

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

Alternative fuel

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

Diagnostic information

This relates to mechanical condition, including wear, run out, pressures, flow, leakage and electrical measurements such as voltage and pulse displays, electronic systems data, including fault codes, sensor measurements and control unit outputs and/or signals.

Electrical systems

Excluding high voltage system

Functional testing

Examples include performance testing and road testing where relevant.

Hydraulic/pneumatic and fluid systems

Examples include oil coolers, oil pumps and torque converters.

Recommendations:

Examples include servicing, dismantling for further inspection and test, repair and replacement.

Rectification activities:

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

Transmission and driveline system fault

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

Transmission area

Clutch assemblies, clutch operating systems, manual and automatic gear boxes (including electronic control), drivelines, hubs and final drive assemblies.

Vehicles

These can be any of the following types of light vehicle: SI, CI, Hybrid, Electric or Alternative fuel vehicles.

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