

IMIHV07

Diagnose and rectify large goods and passenger vehicle
combustion engine and component faults



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Overview

This standard is about diagnosing and rectifying faults occurring in large goods and

passenger vehicle combustion engine mechanical, electrical, hydraulic and fluid
systems.

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Performance
criteria

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- You must be able to:
- P1 use suitable personal and vehicle protective equipment when using diagnostic methods and carrying out **rectification activities**
 - Deleted:** wear
 - Deleted:** and use vehicle coverings (where appropriate)
 - P2 support the identification of **faults**, by reviewing vehicle:
 - P2.1 technical data
 - P2.2 diagnostic test procedures
 - P3 prepare the vehicle, vehicle systems and work area for safe working procedures as appropriate to the vehicle and environment
 - Deleted:** (where appropriate)
 - P4 prepare, connect and test all the required **equipment** following manufacturers' instructions prior to use
 - P5 use **diagnostic methods** which are relevant to the symptoms presented
 - P6 collect sufficient diagnostic information in a systematic way to enable an accurate diagnosis of engine system **faults**
 - P7 identify and record any system deviation from manufacturer's tolerances
 - Deleted:** acceptable limits
 - P8 ensure your assessment of dismantled sub-assemblies, components and units identifies their condition and suitability for repair or replacement
 - Deleted:** accurately
 - Deleted:** , accurately
 - P9 inform the relevant person(s) promptly where repairs are uneconomic or unsatisfactory to perform
 - P10 use the **equipment** required, correctly and safely throughout all **rectification activities**
 - P11 carry out all **rectification activities** following:
 - P11.1 manufacturers' instructions
 - P11.2 recognised repair methods
 - P11.3 your workplace procedures
 - P11.4 health, safety and environmental requirements
 - Deleted:** and
 - Deleted:** <#>environmental requirements¶
 - P12 work in a way which minimises the risk of:
 - P12.1 damage to other vehicle systems, units and components
 - Deleted:** <#>damage to other components and units¶
 - P12.2 contact with leakages and hazardous substances
 - Deleted:** contact with hazardous substances
 - P12.3 damage to your working environment
 - Deleted:** contact with hazardous substances
 - P12.4 injury to self and others
 - P13 ensure all repaired and replaced components and units conform to the vehicle operating specification and any legal requirements
 - P14 adjust components and units correctly to ensure that they operate to meet system requirements, when necessary

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- P15 record and report any additional **faults** you notice during the course of work promptly
- P16 use testing methods which are suitable for assessing the performance of the system rectified
- P17 ensure the rectified engine system performs to the vehicle operating specification and any legal requirements prior to return to the customer/driver
- P18 ensure your records are accurate, complete and passed to the relevant person(s) within the agreed timescales in the format required
- P19 complete all system diagnostic activities within the agreed timescale
- P20 report any anticipated delays in completion to the relevant person(s) promptly

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Knowledge and
understanding

Legislative and organisational requirements and procedures

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You need to know
and understand:

- 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 the implications on an Operators Licence of not carrying out repairs and inspections correctly
- K3 legal requirements relating to the vehicle (including road safety requirements and European Emissions Standards)
- K4 your workplace procedures for
 - K4.1 recording diagnostic and **rectification activities**
 - K4.2 the referral of problems
 - K4.3 reporting delays to the completion of work
- K5 the importance of working to recognised diagnostic and rectification procedures and processes and obtaining the correct information for diagnostic and rectification activities to proceed**
- K6 the importance of recording diagnostic and rectification information
- K7 the importance of working to agreed timescales and keeping others informed of progress
- K8 the relationship between time, costs and productivity
- K9 the importance of reporting anticipated delays to the relevant person(s) promptly

You need to know
and understand:

- Electrical and electronic principles**
- K10 electrical and electronic principles associated with engine systems, including **Deleted: 1**
 - types of sensors and actuators, their application and operation
 - K11 how electrical and electronic engine systems operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles
 - K12** the interaction between electrical, electronic and mechanical components with vehicle engine systems
 - K13 how engine electrical systems interlink and interact, including multiplexing
 - K14** electrical symbols, units and terms
 - K15 electrical safety procedures

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You need to know
and understand:

- K16 the hazards associated with working on or near high voltage electrical vehicle components **Deleted:** energy

Use of diagnostic and rectification equipment

- K17 how to prepare and check the accuracy of diagnostic testing **equipment** **Deleted:** 1
K18 how to use diagnostic and rectification **equipment** for engine mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems (including any emissions controls); specialist engine repair tools and general workshop **equipment** **Deleted:** test

You need to know
and understand:

Combustion engine electrical faults, their diagnosis and correction

- K19 how engine mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems are constructed, operate, dismantled and reassembled **Deleted:** E **Deleted:** 1

- K20 how engine mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems are dismantled, reassembled and adjusted to manufacturers' specifications

- K21 the types and causes of engine mechanical, electrical, electronic, hydraulic/pneumatic and fluid system, component and unit **faults** and failures

- K22 engine mechanical, electrical, electronic, hydraulic/pneumatic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

- K23 how to find, interpret and use sources of information on engine electrical and electronic operating specifications, diagnostic test procedures, repair procedures and legal requirements

- K24 vehicle operating specifications for limits, fits and tolerances relating to engine mechanical, electrical, electronic, hydraulic and fluid systems for the vehicle(s) on which you work

- K25 how to select the most appropriate diagnostic testing method for the symptoms presented

- K26 how to carry out systematic diagnostic testing of engine mechanical, electrical and electronic, hydraulic and fluid systems using a prescribed process or format and **diagnostic methods** **Deleted:** the

- K27 how to assess the condition of mechanical, electrical, electronic, hydraulic/pneumatic and fluid components and units **Deleted:** listed in the Scoping Statement for this unit **Deleted:** evident within

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- K28 how to interpret test results and vehicle data in order to identify the location and cause of vehicle system **faults**
- K29 how to carry out rectification activities in order to correct **faults** in the engine mechanical, electrical, electronic, hydraulic/pneumatic and fluid systems
- K30 the relationship between test methodology and the **faults** repaired – the use of appropriate testing methods
- K31 how to make cost effective recommendations for rectification
- K32 the importance of inspecting the vehicle following any repairs

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Scope/range

1. **Faults** occur within:
 - 1.1. the engine mechanical system
 - 1.2. the engine electrical and electronic systems
 - 1.3. the engine hydraulic and fluid systems

2. **Diagnostic methods** are:

- 2.1. sensory
- 2.2. measurement
- 2.3. functional testing
- 2.4. 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

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4. **Equipment** is:

- 4.1. diagnostic and rectification equipment for engine mechanical systems
- 4.2. diagnostic and rectification equipment for engine electrical systems
- 4.3. diagnostic and rectification equipment for engine hydraulic/pneumatic and fluid systems
- 4.4. specialist repair tools
- 4.5. general workshop equipment

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5. **Rectification activities** are:

- 5.1. dismantling
- 5.2. replacement of units and components
- 5.3. adjustment of units and components
- 5.4. repairs to wiring and connectors
- 5.5. re-programming vehicle systems
- 5.6. reassembly

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5.7. functional testing

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Additional
information

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

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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.

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Diagnostic information:

This relates to mechanical condition, including wear, run out, pressures and compressions, 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.

~~Deleted: Commercial Vehicles:¶~~

These are medium and large goods vehicles of 3500kgs gross vehicle mass (GVM) and above.¶

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Engine Area:

Engine mechanical, cooling systems, electronic ignition, petrol fuel injection, diesel fuel injection, lubrication, engine management systems, emission and environmental control systems.

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~~Deleted: exhaust gas re-circulation and starting/charging~~

Engine and component faults:

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

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These are faults that require a two or more step diagnostic activity using a prescribed process or format to identify the cause.

Functional testing:

Examples include: compression testing, performance testing and road testing where relevant.

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Hydraulic and fluid systems:

These are fuels, oil, lubrication, cooling etc.

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Large Goods and Passenger Vehicles:

These are medium and large goods vehicles, buses and coaches of 3500kgs gross vehicle mass (GVM) and above.

Recommendations:

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

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Suite Maintenance and Repair - Large Goods and Passenger Vehicle

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Key words Engine; units; components; commercial; vehicle; heavy; diagnose; rectify; electrical; hydraulic; mechanical; bus; coach

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