

IMIHV13

Diagnose and rectify large goods and passenger vehicle transmission and driveline system faults



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Overview

This standard is about diagnosing and rectifying faults occurring within large goods and passenger vehicle gearboxes, axles and bearings, driveline, final drive and clutches, including those which incorporate electric and hybrid driveline 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 suitable personal protective equipment and use vehicle coverings (where appropriate) 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, vehicle systems and work area for safe working procedures as appropriate to the vehicle and environment,

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P4 prepare, connect and check all the required **equipment** following manufacturers' instructions prior to use

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P5 use **diagnostic methods** which are relevant to the symptoms presented

P6 collect diagnostic information in a 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 identify and record any system deviation from acceptable limits accurately

P9 ensure your assessment of dismantled sub-assemblies, components and units accurately identifies their condition and suitability for repair or replacement

Deleted: ensure your assessment of dismantled sub-assemblies, components and units identify their condition and suitability for repair or replacement, accurately

P10 inform the relevant person(s) promptly where repairs are uneconomic or unsatisfactory to perform

P11 use the **equipment** required, correctly and safely throughout all **rectification activities**

P12 carry out all **rectification activities** following:

P12.1 manufacturer's instructions

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P12.2 recognised repair methods

P12.3 your workplace procedures

P12.4 health, safety and environmental requirements

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P13 work in a way which minimises the risk of :

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P13.1 damage to other vehicle systems, units and components

P13.2 contact with leakages and hazardous substances

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P13.3 damage to your working environment

P13.4 injury to self and others,

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P14 ensure all repaired and replaced components and units conform to the vehicle operating specification and any legal requirements

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- P15 adjust components and units correctly to ensure that they operate to meet system requirements, when necessary
- P16 record and report any additional **faults** you notice during the course of work promptly
- P17 use testing methods which are suitable for assessing the performance of the system rectified
- P18 ensure the transmission and driveline system rectified performs to the vehicle operating specification and any legal requirements prior to return to the customer
- P19 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required
- P20 complete all system diagnostic activities within the agreed timescale
- P21 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 legal requirements relating to the vehicle (including road safety requirements)
- K3 the implications on an Operators Licence of not carrying out repairs and inspections correctly
- 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 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 productivity
- K8 the importance of reporting anticipated delays to the relevant person(s) promptly

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You need to know and understand:

Electrical and electronic principles

- K9 the hazards associated with working on or near high voltage electrical vehicle components
- K10 electrical and electronic principles associated with large goods and passenger vehicle transmission and driveline systems, including types of sensors and actuators, their application and operation
- K11 how large goods and passenger vehicle electrical and electronic **transmission and driveline 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 and systems within large goods and passenger vehicle transmission and driveline systems, including electric and hybrid driveline systems,
- K13 electrical symbols, units and terms
- K14 electrical safety procedures

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You need to know and understand:

Use of diagnostic and rectification equipment

- K15 how to prepare and check diagnostic testing **equipment**
- K16 how to use diagnostic and rectification **equipment** for large goods and passenger vehicle transmission and driveline mechanical, electrical, pneumatic, hydraulic and fluid systems, specialist repair tools and general workshop **equipment**

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You need to know and understand:

Transmission and driveline faults, their diagnosis and correction

- K17 how large goods and passenger vehicle transmission and driveline mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems are constructed, dismantled, reassembled and operate
- K18 the types and causes of large goods and passenger vehicle transmission and driveline mechanical, electrical, electronic, pneumatic, hydraulic and fluid system component and unit **faults** and failures
- K19 large goods and passenger vehicle transmission and driveline mechanical, electrical, electronic, pneumatic, hydraulic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action
- K20 how to find, interpret and use sources of information on large goods and passenger vehicle transmission and driveline electrical and electronic operating specifications, diagnostic test procedures, repair procedures and legal requirements
- K21 vehicle operating specifications for limits, fits and tolerances relating to transmission and driveline mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems for the vehicle(s) on which you work
- K22 how to select the most appropriate diagnostic testing method for the symptoms presented
- K23 how to carry out systematic diagnostic testing of large goods and passenger vehicle transmission and driveline mechanical, electrical, electronic, pneumatic, hydraulic and fluid systems using a prescribed process or format
- K24 how to assess the condition evident within large goods and passenger vehicle transmission and driveline mechanical, electrical, electronic, pneumatic, hydraulic and fluid components and units

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- K25 how to interpret test results and vehicle data in order to identify the location and cause of vehicle system **faults**
- K26 how to carry out **rectification activities** in order to correct **faults** in large goods and passenger vehicle transmission and driveline mechanical, electronic, pneumatic, hydraulic and fluid systems
- K27 the relationship between test methodology and the **faults** repaired – the use of appropriate testing methods
- K28 how to make cost effective recommendations for rectification
- K29 the importance of inspecting the vehicle following any repairs

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Scope/range

1. **Transmission and driveline systems** are
 - 1.1. gearbox and power take off
 - 1.2. axles and bearings
 - 1.3. driveline shafts
 - 1.4. clutch
 - 1.5. final drive
 - 1.6. electric and hybrid driveline systems

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

3. **Equipment** is
 - 3.1. diagnostic and rectification equipment for transmission and driveline mechanical systems
 - 3.2. diagnostic and rectification equipment for transmission and driveline electrical systems
 - 3.3. diagnostic and rectification equipment for transmission and driveline hydraulic and fluid systems
 - 3.4. diagnostic and rectification equipment for transmission and driveline pneumatic systems
 - 3.5. specialist repair tools
 - 3.6. general workshop equipment

4. **Faults** are
 - 4.1. mechanical
 - 4.2. electrical and electronic
 - 4.3. hydraulic and fluid
 - 4.4. pneumatic

5. **Rectification activities** are:
 - 5.1. dismantling

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- 5.2. replacement of units and components
- 5.3. measurement and adjustment of units and components
- 5.4. repairs to wiring and connectors
- 5.5. re-programming vehicle systems
- 5.6. reassembly
- 5.7. functional testing
- 5.8. repairs to air line and connectors

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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, 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.

Functional testing:

Examples include dynamometer, performance testing and road testing where relevant.

Hydraulic and fluid systems:

These are large goods and passenger vehicle transmission and driveline related hydraulic and fluid systems.

Large Goods and Passenger Vehicles:

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

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Recommendations:

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

Transmission Area:

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

Transmission and driveline system faults:

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

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