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**Overview**

This standard is about identifying electronic enhancements, vehicle electronic security systems and vehicle tracking systems for vehicle types to ensure that the vehicle enhancement meets the specification and functionality of the vehicle.

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**Performance****criteria**

- You must be able to:**
- P1 identify which vehicle electronic enhancement products meet the customers requirements and will also integrate fully with the vehicle factory fit electronic systems
  - P2 support the identification of suitable vehicle enhancement installations by reviewing:
    - P2.1 vehicle technical data
    - P2.2 diagnostic test procedures
    - P2.3 customer requirements
    - P2.4 electrical component technical data
  - P3 select and use suitable personal protective equipment and use appropriate vehicle protection at all times
  - P4 prepare and test all the tools and equipment required, following manufacturers' instructions, prior to use
  - P5 fit vehicle enhancement components which are compatible with the vehicle specification and customer requirements
  - P6 carry out all enhancement activities following:
    - P6.1 manufacturers' procedures
    - P6.2 your workplace procedures
    - P6.3 health and safety requirements
    - P6.4 legal requirements
  - P7 work in a way which minimises the risk of:
    - P7.1 damage to other vehicle systems
    - P7.2 damage to other components and units
    - P7.3 contact with leakages
    - P7.4 contact with hazardous substances
    - P7.5 injury to yourself and others
  - P8 adjust the components fitted and vehicle systems (including any reconfiguration of electronic systems) to ensure that they comply with all relevant specification for effective operation, if appropriate
  - P9 ensure all vehicle enhancements made to the vehicle function to its specification

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- P10 ensure that all vehicle systems function correctly prior to handover to the customer
  - P11 complete all enhancement activities within the agreed timescale
  - P12 report any anticipated delays in completion to the relevant person(s) promptly
  - P13 liaise with other relevant person(s) (or with the customer) to agree the next course of action if there are any issues with the vehicle enhancement
  - P14 ensure your records are complete, accurate, in the format required and signed by the customer, when necessary
  - P15 explain to customers any action that has been taken regarding their vehicle in non technical terms to give a clear understanding of the work carried out

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**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 enhancing vehicle systems
- 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 procedures and processes and obtaining the correct information for enhancement activities to proceed and how to formulate and construct procedures and processes in order for enhancement activities to proceed
- K5 the importance of documenting installation and enhancement information
- K6 the importance of working to agreed timescales and keeping others informed of progress
- K7 the relationship between time and costs
- K8 the importance of reporting anticipated delays to the relevant person(s) promptly

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 operate, including electrical component function, electrical inputs, outputs, voltages/current levels and their associated patterns/waveforms
- K13 the interaction between electrical, electronic and mechanical components within the systems defined

- K14 how electrical systems interlink and interact, including networking protocols
- K15 the functionality of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles
- K16 how installed electronic enhancements interact with factory fit electronic components, including networking systems

You need to know  
and understand:

**Use of electrical testing equipment**

- K17 how to prepare and test the accuracy of diagnostic testing equipment
- K18 how to use electrical and electronic testing equipment to correctly and safely test electrical and electronic systems
- K19 how to find, interpret and use sources of information on electrical operating specification and legal requirements
- K20 how to use dedicated and computer based equipment to configure vehicle electronic controlled systems to operate correctly within legal requirements
- K21 how to prepare and reconfigure electronically controlled vehicle enhancement systems to allow them to function correctly with factory fit vehicle systems
- K22 how to rectify electrical and electronic faults, in standard and enhanced / modified systems
- K23 how to make suitable adjustments to components and units

**Scope/range**

- 1. Enhancements** may include:
  - 1.1. audio systems
  - 1.2. visual systems
  - 1.3. communication systems
  - 1.4. networking systems
  - 1.5. body electric systems
  - 1.6. data logging
  - 1.7. safety systems
  - 1.8. lighting systems
  - 1.9. tow bar electrical systems
  - 1.10. auxiliary power supplies
  - 1.11. telematics/vehicle location systems
  - 1.12. electronic security systems
  - 1.13. software modification
  
- 2. Electronic Security Systems** may include:
  - 2.1. alarm systems
  - 2.2. immobiliser systems
  - 2.3. location/tracking systems
  - 2.4. electronic deadlocking systems
  
- 3. Electrical and electronic testing equipment** covers::
  - 3.1. volt meters
  - 3.2. ammeters
  - 3.3. ohmmeters
  - 3.4. multimeters
  - 3.5. dedicated and computer based diagnostic equipment
  - 3.6. oscilloscopes
  
- 4. Tools and equipment** include:
  - 4.1. hand tools
  - 4.2. special purpose tools
  - 4.3. general workshop equipment
  - 4.4. electrical and electronic testing equipment

**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

**Vehicles:**

These can be any of the following – light vehicles, heavy goods and public service vehicles, motorcycles, mopeds and scooters, fork lift trucks, motorhomes and emergency services vehicles.

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