

Diagnose, remove, replace and recalibrate motor vehicle Advanced Driver Assistance System components

Overview

This standard is about identifying and rectifying faults occurring in Advanced Driver Assistance Systems (ADAS) by carrying out diagnostic activities and then removing, replacing and recalibrating sensors. ADAS includes systems for driver safety, pedestrian safety, motion/stability control and collision avoidance systems.

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Performance criteria

You must be able to:

- P1 use appropriate personal and vehicle protective equipment when carrying out testing, diagnosis and **rectification activities**
- P2 support the identification of **Advanced Driver Assistance Systems** faults, by reviewing vehicle:
 - P2.1 technical data
 - P2.2 diagnostic test procedures
- P3 prepare and check the required **testing and diagnostic** equipment following manufacturers' instructions prior to use
- P4 use all **tools and equipment** required for your diagnostic and rectification activities, correctly and safely throughout
- P5 use **testing techniques** which are relevant to the symptoms presented
- P6 collect diagnostic information in a logical and systematic way to enable an accurate diagnosis of Advanced Driver Assistance System faults
- P7 identify and record any system deviation from acceptable limits
- P8 make cost effective, accurate recommendations for rectification based on your analysis of the diagnostic information gained
- P9 carry out all diagnostic and rectification activities following:
 - P9.1 manufacturers' instructions
 - P9.2 recognised researched replacement methods
 - P9.3 health, safety and environmental requirements
- P10 work in a way that minimises the risk of:
 - P10.1 damage to other vehicle systems
 - P10.2 damage to other components and units
 - P10.3 contact with leakages
 - P10.4 contact with hazardous substances
- P11 ensure the **calibration environment** is as identified by the manufacturer's instructions
- P12 ensure all replacement components conform to the vehicle operating specification and any legal requirements

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- P13 **recalibrate** Advanced Driver Assistance System **sensors** correctly to ensure that they operate to meet system requirement
- P14 ensure your records are accurate, complete and passed to the relevant person(s) within the agreed timescale and in the format required
- P15 complete all diagnostic and rectification activities within the agreed timescale
- P16 report any anticipated delays in completion to the relevant person(s) promptly

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Knowledge and understanding

You need to know
and understand:

- K1 the current health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when diagnosing, removing, replacing and recalibrating **Advanced Driver Assistance System** components
- K2 legal requirements relating to the Advanced Driver Assistance Systems and components
- K3 your workplace procedures for:
 - 3.1 recording fault location and correction activities
 - 3.2 reporting the results of tests
 - 3.3 completing and storing documentation relating to ADAS calibration
 - 3.4 the referral of problems
 - 3.5 reporting delays to the completion of work
 - 3.6 the calibration environment as identified by the manufacturer's instructions
- K4 the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed
- K5 types of ADAS diagnostic equipment
- K6 the importance of documenting diagnostic and rectification information
- K7 the importance of working to agreed timescales and keeping others informed of progress
- K8 the importance of customer interaction relating to which systems can/can't be calibrated
- K9 the relationship between time, costs and productivity
- K10 the importance of reporting anticipated delays to the relevant person(s) promptly
- K11 types of ADAS **sensors** and their function
- K12 identifying the types of **vehicle calibration**
- K13 features of **ADAS system operation**
- K14 electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction, digital and fibre optics principles, radio waves and doppler shifts, electrical symbols, units and terms, electrical safety procedures
- K15 how electrical and electronic units and components are constructed, dismantled and reassembled
- K16 how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltage/current variation and patterns
- K17 the interaction between electrical, electronic and mechanical components within the systems defined

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| K18 | how electrical systems interlink and interact, including multiplexing |
| K19 | how to prepare and check the accuracy of diagnostic testing equipment |
| K20 | how to use electrical and electronic testing equipment to correctly and safely diagnose ADAS faults |
| K21 | the types and causes of Advanced Driver Assistance System failures |
| K22 | the circumstances which will necessitate replacement and recalibration of Advanced Driver Assistance System components and other possible courses of action |
| K23 | how to find, interpret and use sources of information on Advanced Driver Assistance System operating specifications, diagnostic test procedures, removal, replacement and recalibration procedures and legal requirements |
| K24 | how to carry out systematic diagnostic testing of Advanced Driver Assistance System components using electrical and electronic testing techniques |
| K25 | how to select the most appropriate diagnostic testing method for the symptoms presented |
| K26 | how to interpret test results and vehicle data in order to identify the location and cause of Advanced Driver Assistance System faults |
| K27 | how to remove, replace and recalibrate Advanced Driver Assistance System components |
| K28 | how to make cost effective recommendations for rectification |

Scope/range

1. Faults occurring in the following **Advanced Driver Assistance Systems**:

- a. Driver safety
- b. Pedestrian Safety
- c. Motion/stability control
- d. Collision Avoidance Systems

2. **Testing and diagnostic equipment** includes:

- a. volt meters,
- b. ammeters,
- c. ohmmeters
- d. multimeters
- e. battery testing equipment
- f. dedicated and computer based diagnostic equipment
- g. oscilloscopes
- h. ADAS recalibration equipment

3. **Tools and equipment** include:

- a. hand tools
- b. special purpose tools
- c. general workshop equipment

4. **Diagnostic testing** is defined as:

- a. verify the fault
- b. collect further information
- c. evaluate the evidence
- d. carry out further tests in a logical sequence
- e. rectify the problem
- f. check all systems

5. **Testing techniques** include:

- a. voltage, resistance and current measuring
- b. frequency measuring

- c. visual
- d. dedicated and computer-based testing

6. **Calibration environment** includes:

- a. targets
- b. lighting
- c. radar boards

7. **Sensors** include:

- a. optical
- b. radar
- c. lidar
- d. ultra-sonic

8. Recalibrate to include:

- a. static
- b. dynamic
- c. hybrid systems

9. **ADAS system operation** to include:

- a. steering
- b. braking
- c. lane departure
- d. driver assistance
- e. parking

Glossary

Rectification activities are defined as:

A suitable replacement and recalibration of a component(s) that rectifies the fault(s) identified from the diagnostic activities carried out

Driver safety

For example, night vision, glare-free high beam and pixel light, automatic parking, blind spot monitor, driver drowsiness detector, driver monitoring system, traffic sign recognition.

Pedestrian safety

For example, pedestrian detection systems.

Motion/stability control

For example, lane change assistance, hill descent control

Collision avoidance system

For example, forward collision warning, surround view sound, night vision, lane departure warning.

Agreed timescales

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

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