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## Overview

This standard identifies the basic competences that you need, to carry out maintenance activities on motorsport vehicle electrical systems, in accordance with approved procedures. It will prepare you for entry into the motorsport sector, creating a progression between education and employment, or it will provide a basis for the development of additional skills and occupational competences in the working environment.

The activities will involve dismantling, removing and replacing or repairing faulty components, in line with company procedures, on electrical equipment that uses battery, alternating current generators, or direct current power supplies. This includes equipment such as control systems, switches and solenoids, starter motors, wiring harnesses and instrumentation panel, wiring enclosures and warning lights, vehicle lighting systems, data acquisition systems and other specific electrical equipment.

You will be expected to apply a range of maintenance techniques and procedures, such as selection of materials, attaching connectors, shielding, testing, isolating, disconnecting, removing and reconnecting electrical components and looms, attaching cable identification markers, replacing damaged or defective electrical components and looms, setting and adjusting components, and making continuity checks before testing and starting up the equipment.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, to take account of any potential difficulties or problems that may arise, and to seek appropriate help and advice in determining and implementing a suitable solution. You will be expected to work with either a high level of supervision or as a member of a team. Where team working is involved, you must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

On completion of the activities, you must show that you can competently clean the work area that you are responsible for, including tidying up bays or garages to a standard that will reflect the professional image of the team. You must show that you can use and maintain the tools and equipment needed for the maintenance activities, and return them to their recognised storage area ready for further use.

Your underpinning knowledge will be sufficient to provide a broad understanding of your work, and will enable you to apply the appropriate electrical maintenance procedures. You will know how the motorsport electrical equipment functions, the common faults that can occur, the purpose of the individual components and associated defects, in adequate depth to carry out the maintenance, repair or adjustment activities, and to ensure that the equipment functions to the required specification. In addition, you will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications.

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You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

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## Performance criteria

### You must be able to:

1. work safely at all times, complying with health and safety legislation, regulations, directives and other relevant guidelines
2. obtain all the information you need for the motorsport vehicle electrical maintenance activities to be carried out
3. follow the relevant maintenance procedures to carry out the required work
4. carry out the maintenance activities, within the limits of your personal authority
5. carry out the maintenance activities in the specified sequence, and in an agreed timescale
6. report any instances where the maintenance activities cannot be fully met, or where there are identified defects outside the planned schedule
7. use the evidence you have gained to during maintenance activities to improve future reliability and performance of the motorsport vehicle
8. complete the relevant maintenance records accurately, and pass them on to the appropriate person
9. dispose of waste materials, in accordance with safe working practices and approved procedures
10. tidy up on completion of the electrical maintenance activities

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## Knowledge and understanding

### You need to know and understand:

1. the specific safety practices and procedures that you need to observe when carrying out electrical maintenance activities on motorsport vehicles (including lifting and handling techniques; safe working practices with regard to removing components from motorsport vehicles; procedures which satisfy current regulations - such as HASAWA, COSHH, PUWER and other related legislation and guidelines)
2. the hazards associated with removing and replacing motorsport vehicle electrical components, and with the tools and equipment used (such as ensuring the safe support of the vehicle at the correct working height and position, ensuring the safe isolation of the circuits/equipment, removal of fuses, misuse of tools), and how they can be minimised
3. the protective equipment that you need to use for both personal protection (PPE) and protection of the vehicle
4. the importance of good housekeeping within the working area (such as leaving the work area free of debris and used materials, cleaning and maintaining tools and equipment, returning equipment to designated storage area, leaving the work area in a safe and tidy condition), and of good personal presentation to ensure quality representation of the team or organisation
5. how to use and extract information from motorsport vehicle documentation (such as vehicle manuals, system diagrams, telemetry data, engineer's records, set-up sheets, inspection reports)
6. the importance of ensuring that you use the correct and up-to-date documentation
7. the basic principles of how the motorsport vehicle electrical equipment functions, its operating sequence, the working purpose of individual units/components and how they interact
8. the different types of cabling and their application (such as multicore cables, single core cables, screened cables) as used on motorsport vehicles
9. the care, handling and application of electrical measuring instruments
10. the techniques used to dismantle/assemble electrical equipment (such as unplugging, de-soldering, removal of screwed, clamped and crimped connections)
11. the various types of electrical connectors that are used, methods of unlocking, orientation indicators and locating and locking in of the connections
12. methods of removing and replacing cables, wires and looms without causing damage to existing cabling or other vehicle components
13. the use of BS/ISO wiring and other regulations when selecting wires

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- and cables, and when carrying out tests on systems
14. methods of attaching identification markers/labels to removed components or cables to assist with re-assembly
  15. the tools and equipment used in the maintenance activities (such as cable stripping tools, crimping tools, soldering irons and torches, gland connecting tools)
  16. methods of checking that components are fit for purpose, and the need to replace 'lived' consumable items (such as seals and gaskets, overload protection devices)
  17. how to make adjustments to components/assemblies to ensure that they function correctly
  18. how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are set up correctly for the intended purpose
  19. the importance of making 'off-load' checks before proving the equipment with the electrical supply on
  20. the equipment operating and control procedures to be applied during the maintenance activity
  21. how to use appropriate lifting and handling equipment techniques in the maintenance activity
  22. the problems that can occur during the maintenance activity, and how they can be overcome
  23. the recording documentation to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation
  24. when to act on your own initiative and when to seek help and advice from others
  25. the importance of leaving the work area and vehicle in a safe and clean condition on completion of the maintenance activities (such as returning tools and equipment to the designated location, cleaning the work area, and removing and disposing of waste)

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### Scope/range related to performance criteria

1. Carry out **all** of the following during the electrical maintenance activities:
  1. plan the maintenance activities, in conjunction with others involved, so as to minimise disruption to motorsport vehicle preparation
  2. use the correct issue of drawings, job instructions and procedures
  3. adhere to risk assessment, COSHH and other relevant safety standards
  4. ensure the safe isolation of equipment (such as mechanical, electricity, fuel, air or fluids)
  5. ensure that safe working arrangements have been provided for the maintenance area (such as pit lane/service point)
  6. re-connect and return the equipment to service on completion of activities
  7. dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in a safe condition
2. Carry out maintenance of electrical equipment on **one** of the following types of motorsport vehicle:
  1. single seater
  2. karts
  3. motorcycles (such as circuit and off-road)
  4. rallying
  5. historic
  6. sports cars
  7. other specific approved competition vehicle
3. Carry out maintenance activities on **five** of the following types of motorsport vehicle sub-systems:
  1. charging systems
  2. lighting systems
  3. data acquisition system
  4. instrumentation, indication and warning systems
  5. direct current power supply system
  6. electrical control system
  7. auxiliary motorsport vehicle power supply system
  8. safety and emergency systems

4. Carry out **all** of the following maintenance activities:
  1. isolating the equipment
  2. disconnecting and reconnecting wires and looms
  3. attaching suitable cable identification markers
  4. removing electrical units/components
  5. checking components for serviceability
  6. replacing damaged/defective components
  7. examining wiring looms for chafing, dislodging, correct routeing, protection in hazardous areas
  8. removing and replacing damaged wires and looms
  9. setting and adjusting replaced components
  10. making 'continuity' checks before powering up
  11. functionally testing the maintained equipment
5. Replace and/or repair a range of motorsport vehicle electrical components, to include **ten** of the following:
  1. looms and connectors
  2. capacitors
  3. batteries
  4. locking and retaining devices
  5. circuit boards
  6. solenoids
  7. overload protection devices
  8. lighting components
  9. thermistors or thermocouples
  10. pickup sensor
  11. electrical switches or sensors
  12. starter motors
  13. relay components
  14. manual switches
  15. transmitter beacons
  16. potentiometers
  17. other specific motorsport related components
6. Maintain motorsport vehicle electrical equipment, in compliance with **one** of the following standards:
  1. Race Associations (such as FIA, MSA)
  2. BS or ISO standards and procedures
  3. vehicle manufacturer's specification
  4. customer standards and requirements
  5. team/company standards and procedures
  6. specific system requirements
7. Complete **one** of the following maintenance records and pass it to

the appropriate person:

1. job cards
2. computer records
3. company specific documentation
4. formal risk assessment
5. vehicle maintenance logs or reports



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## Behaviours

# Additional Information

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

SEMPEO259

Carrying out maintenance activities on motorsport vehicle electrical equipment



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