SEMAUT3036

Assembling and disassembling electrical and electronic equipment on experimental vehicles

Overview

This standard identifies the competences you need to assemble/disassemble experimental electrical and electronic equipment, and to develop and install wiring looms to new models/experimental vehicles, in accordance with approved procedures. You will be required to assemble a range of electrical units, such as audio equipment, safety systems, heating and ventilating system, power-up system, entertainment systems, control systems, motors navigation systems, lighting systems, and other components specifically made for the development of experimental vehicles, by using a variety of assembly methods and techniques. You will also develop wiring looms to connect the electrical systems, as the specification requires, including modification of existing components. You will be expected to use a range of tools and specialised equipment associated with the assembly methods, and to check that the assembly has been completed to the level of accuracy and quality required by the specification.

Your responsibilities will require you to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with the process that you cannot resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying procedures appropriate to the assembly of electrical wiring, system units and components for experimental vehicles. You will understand the assembly and disassembly methods and techniques used, and their application, and will know about the expected development process, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the assembly activities, especially those for jacking and supporting the vehicle and ensuring systems are safely isolated prior to dismantling. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the relevant instructions, assembly drawings and any other specifications
3. ensure that the specified components are available and that they are in a usable condition
4. assemble and secure the components in their correct positions using appropriate methods and techniques
5. check the finished assembly is complete and ready for tests to be carried out
6. dismantle the tested assembly to agreed level using appropriate tools and techniques
7. deal promptly and effectively with problems within your control and report those that cannot be solved
8. ensure that work records are completed, stored securely and available to others as per organisational requirements
9. leave the work area in a safe condition on completion of the activities, as per organisational and legal requirements

Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken whilst carrying out the activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials)
2. the health and safety requirements of the work area and the activities, and the responsibility these requirements place on you
3. the hazards associated with the activities, and how to minimise them and reduce risks
4. the personal protective equipment and clothing (PPE) to be worn during the activities
5. the precautions to be taken to prevent electrostatic discharge (ESD) damage to circuits and sensitive components (such as use of earthed wrist straps)
6. the procedures for obtaining the various types of circuit drawings, sketches, development sheets, job instructions and other related specifications that are used during the assembly and disassembly of electrical/electronic equipment, and how to interpret them correctly
7. how to identify the electrical/electronic equipment/components to be used; component identification systems (such as codes and component/equipment orientation indicators)
8. the assembly and disassembly methods and procedures to be used, and the importance of adhering to these procedures
9. how the components/equipment is to be aligned and positioned prior to securing, and the tools and equipment that are used
10. the various joining, fastening and connecting devices that will be used, and their method of installation and disassembly
11. the function of the various items of electrical/electronic equipment or components
12. the functions of the various electrical components, hardware and software
13. how software can potentially affect hardware operations
14. the use of torque wrenches, and the importance of ensuring fasteners are adjusted to the required settings
15. the types and rating of wires/cables and fuses; their function and application
16. the principles, conventions and wiring regulations associated with electrical

measurement and assembly
17. the consumables, tools and equipment that are used for constructing and fitting wiring looms to vehicles
18. the importance of using the specified fasteners for the assembly and why you must not use substitutes
19. dealing with components or fastening devices that are incorrectly assembled, damaged or have other faults
20. the quality control procedures to be followed during the assembly and disassembly operations
21. the types of tests which the assemblies will be subjected to
22. how to adjust and make minor alterations to assembled units and their alignment, where appropriate, to meet specifications
23. the procedure to check that the developed units meet the specification and quality control requirements
24. how to conduct any necessary checks to ensure the accuracy and quality of the assembly produced
25. the principles, conventions and wiring regulations associated with electrical measurement and assembly
26. the use of meters and computer-aided fault diagnostic equipment
27. recognising defects (incorrect assembly, ineffective fasteners, foreign object damage)
28. the importance of ensuring that the completed assembly is free from left-over items and foreign objects
29. preparations to be undertaken on the components and fixing points prior to fitting the components into the vehicle
30. how to check that the tools and equipment to be used are correctly calibrated and are in a safe, tested and serviceable condition
31. the importance of ensuring that all tools are used correctly and within their permitted operating range
32. the problems that can occur with the development activities on experimental vehicles, and how these can be overcome
33. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve
34. how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1.

Carry out all of the following during the assembly and dismantling activities:

1.1 obtain and use the appropriate documentation (such as job instructions, drawings, specifications, planning and quality control documentation)
1.2 adhere to procedures or systems in place for risk assessment, hhazardous substances, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
1.3 use safe and approved techniques to dismantle and re-assemble sub-assemblies and components to the vehicles
1.4 check that all tools and measuring equipment to be used are within current calibration/certification dates
1.5 ensure that sub-assemblies and components used are free from damage, foreign objects, dirt or other contamination before assembling them
1.6 return all tools and equipment to the correct location on completion of the fitting activities
1.7 leave the work area and machine in a safe and appropriate condition on completion of the activities

2.

Assemble three of the following electrical systems and/or associated components, to an experimental vehicle:

2.1 audio equipment
2.2 heating and ventilating system
2.3 navigation systems
2.4 lighting systems
2.5 safety systems
2.6 entertainment systems
2.7 power-up system
2.8 motors
2.9 charging points
2.10 Wi-Fi systems
2.11 entertainment systems
2.12 actual vehicle location (AVL) systems
2.13 fuel management system
2.14 control systems
2.15 other specific system

3.

Select types and ratings of wire/cables to produce a loom, including three of the following:

3.1 single strand
3.2 special insulated
3.3 multi-strand

3.4 screened
3.5 other specific cable type

4.

Use a variety of assembly methods and techniques, to include three of the following:

4.1 threaded fastening
4.2 drive/interference fits
4.3 soldered
4.4 cable termination
4.5 clip/spring fastening
4.6 adhesive
4.7 screened cable fitment
4.8 multi-connection

5.

Assemble electrical units to experimental vehicles using or modifying, as appropriate, four of the following components:

5.1 fuses/fusebox
5.2 circuit boards
5.3 clips/fixings
5.4 heating and ventilating systems
5.5 battery holders
5.6 actuators
5.7 power supply systems
5.8 brackets and supports
5.9 sensors
5.10 plugs/sockets
5.11 flexible/rigid pipes
5.12 lighting systems
5.13 wiring/cables
5.14 other specific components

6.

Carry out one of the following test activities:

6.1 pass to physical testing department
6.2 hot/cold test
6.3 destructive test
6.4 new vehicle/component performance check
6.5 life expectancy test
6.6 environmental test

7.

Disassemble units from the experimental vehicle, to carry out one the following checks on the completion of the development test:

7.1 breakages
7.2 loose electrical connections
7.3 cable chaffing

7.4 contamination
7.5 distortion
7.6 loose securing devices
7.7 tripped circuit
7.8 overheating protection devices

8.

Check that electrical and electronic equipment is assembled to, and disassembled from experimental vehicles in compliance with one of the following:

8.1 current standards, codes of practice and legislation
8.2 customer standards and requirements
8.3
company standards and procedures
8.4
specific system development/experimental requirements

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