SEMAUT3139

Setting up and testing prototype vehicle data acquisition systems

Overview

This standard identifies the competences you need to set up, test and adjust prototype vehicle data acquisition equipment, in accordance with approved procedures. The equipment and systems to be setup and tested may be on a bench or test rig, or fitted to the prototype vehicle. You will be required to use appropriate drawings, specifications and test documentation to set up, test and adjust the various items of equipment. You will be expected to use the specified/appropriate techniques to carry out the setting-up and testing procedures in the correct sequence. The equipment to be set up and tested will include data logging systems that record data captured via transducers, thermocouples and other analogue sensors placed strategically on the vehicle.

Your responsibilities will require you to comply with organisational policy and procedures for the setting-up, testing and adjusting activities undertaken, and to report any problems with the activities, components or equipment that you cannot personally 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 the application of setting-up and testing techniques and procedures to prototype vehicle data acquisition systems. You will understand the data acquisition systems being set up and tested, and their application, and will know about the testing and adjustment techniques, test equipment and methods, in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring that the system functions to the required specification.

You will understand the safety precautions required when carrying out the setting-up and testing operations. 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 and guidelines
2. follow all relevant setting-up and operating specifications for the product or asset being configured
3. set up the equipment for tests, following defined procedures and ensuring that all operating parameters are achieved
4. deal promptly and effectively with problems within your control and report those that cannot be solved
5. check that the configuration is complete and that the equipment operates to specification
6. ensure that work records are completed, stored securely and available to others, as per organisational requirements
7. 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. how to obtain and interpret drawings, standards, quality control procedures and test specifications used in the setting up and testing process (current industry standard and code of practice schematics, symbols and terminology used for data acquisition systems)
6. how to carry out currency/issue checks on the specifications you are working with
7. the correct operating procedures of the system being set up and tested
8. the components to be set up and tested, and their function within the particular data acquisition system
9. the adjustments/corrections/tuning required to bring the equipment/system to operational standard through full range parameters
10. the quality control procedures to be followed during the setting-up and testing operations
11. electrical bonding specifications, and their importance
12. the importance of applying electrostatic discharge (ESD) procedures when working on sensitive equipment or devices
13. the types of test equipment to be used, and their selection for particular types of test
14. how to calibrate the test equipment to be used; or the organisational procedures for ensuring that the test equipment is maintained and correctly calibrated
15. how to connect the appropriate test equipment into the circuits/equipment (for the

measurement of such items as continuity, voltage checks, signal noise/interference levels, signal strength, power output, exhaust gas and pressure calibration, temperature and accelerometer calibration, camera alignment and control position calibration)

16. the various testing methods and procedures, as recommended in approved electrical codes of practice, and how to apply them to different operating conditions
17. how to recognise defects (such as under or over performance)
18. the various fault finding techniques that can be used if the system fails the test
19. displaying/recording test results, and the documentation to be used
20. how to interpret the test readings obtained, and the significance of the readings gained
21. how to analyse the test results
22. the authorisation requirements for changes to test procedures
23. the importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits
24. potential problems or errors that could occur, and which may affect the test results, and how they can be avoided
25. the environmental control and company operating procedures relating to the testing activities
26. the procedures to be followed on completion of the tests
27. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve
28. 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 setting-up and testing activities:

1.1 obtain clearance to work on the data system, and observe all relevant isolation and safety procedures
1.2 use the correct issue of the agreed setting-up and testing procedures and quality documentation
1.3 adhere to procedures or systems in place for risk assessment, hazardous substances, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
1.4 provide and maintain safe access and working arrangements for the installation area, and ensure that any appropriate environmental conditions can be met
1.5 check that all tools and test equipment to be used are in a safe, tested and usable condition and are within current calibration dates
1.6 carry out the setting-up and testing activities, using safe and approved techniques and procedures
1.7 where appropriate, apply electrostatic discharge (ESD) protection procedures
1.8 ensure that the testing equipment is operated within its specification range
1.9 ensure that the vehicle and surrounding structures are maintained free from damage and foreign objects
1.10 return all tools and equipment to the correct location on completion of the activities
1.11 leave the vehicle in a safe and appropriate condition on completion of the activities

2.

Test data acquisition equipment for one of the following types of prototype environment:

2.1 environmental test
2.2 engine performance test (dynamometer)
2.3 emissions test
2.4 on-road testing
2.5 other specific prototype vehicles

3.

Test three of the following types of prototype vehicle data acquisition systems:

3.1 data logging system
3.2 audio/visual data transfer systems
3.3 transmission data transfer systems
3.4 engine data transfer systems
3.5 chassis/aerodynamics data transfer system
3.6 test/development data transfer systems

3.7 speed/position data transfer system
3.8 digital data links

4.

Set up and test six of the following prototype data acquisition system components:

4.1 accelerometer and associated pre-amplifiers
4.2 video cameras
4.3 control position potentiometers and indicators
4.4 global positioning systems (GPS)
4.5 linear voltage displacement transducers (LVDT)
4.6 temperature sensors (such as surface, air or immersed probes)
4.7 lambda sensors
4.8 strain gauge components
4.9 controllers
4.10 potentiometers
4.11 rotational speed sensors
4.12 event position indicators
4.13 instrumentation

5.

Carry out tests and adjustments using a range of tools and equipment, to include seven of the following:

5.1 dedicated test equipment
5.2 exhaust gas simulator
5.3 hydro carbon analyser
5.4 pitot-static test set
5.5 vibration table
5.6 computer/test software
5.7 voltage simulators
5.8 multimeter
5.9 thermocouple
5.10 mass air flow meter (such as hot wire)
5.11 pressure tester
5.12 oscilloscope
5.13 strain gauge test set
5.14 simulators

6.

Use appropriate equipment to carry out six of the following types of test:

6.1 temperature calibration
6.2 signal noise/interference levels
6.3 continuity
6.4 accelerometer calibration
6.5 exhaust gas calibration
6.6 resistance
6.7 control position calibration
6.8 condition of components
6.9 open/short circuit

6.10 camera alignment
6.11 operational/parameter checks
6.12 pressure calibration
6.13 signal strength
6.14 voltage checks
6.15 strain gauge checks
6.16 other specific tests

7.

Deal with two of the following levels of complexity during the setting-up and testing activities:

7.1 systems with no faults
7.2 systems with faults
7.3 systems with intermittent faults

8.

Use two of the following fault-finding techniques during the setting-up and testing activities:

8.1 six point
8.2 function testing
8.3 injection and sampling
8.4 half-split
8.5 equipment self-diagnostics
8.6 unit substitution
8.7 input-to-output
8.8 emergent problem sequence

9.

Check tested prototype vehicle data acquisition equipment complies with one of the following:

9.1 current industry standards, codes of practice and procedures
9.2 customer standards and requirements
9.3 engineer developed procedures
9.4 specific vehicle/engine requirements

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