SEMETS316

Inspecting and testing electronic products

Overview

This standard identifies the competences you need to carry out visual inspection and tests on electronic products, in accordance with approved procedures. You will be required to satisfy all preliminary essentials, such as obtaining risk assessment/permits to work, following clean work area protocols in appropriate cases. In addition, you will be expected to check the currency of and review testing requirements, set up and prepare the testing facilities for use, conduct prescribed tests, consider the implications of the results obtained and record and report your findings.

Your responsibilities will require you to comply with organisational policy and procedures for the testing activities undertaken, and to report any problems with the activities or with the tools and equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking full 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 inspection and test procedures for electronic products. You will understand the basic operating principles of the items being tested, and their application, in adequate depth to provide a sound basis for carrying out the activities and recognising when circuits/components do not meet the required specification.

You will understand the safety precautions required when working in the electronic product and circuit-testing environment, and with the equipment that is used. 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 legislation and other relevant regulations, directives and guidelines
2. follow the appropriate procedures for use of tools and equipment to carry out the required inspections/tests
3. set up and carry out the inspections/tests using the correct procedures and within agreed timescales
4. record the results, and complete inspection documentation in the appropriate format
5. review the results and carry out further tests if necessary

Knowledge and understanding

You need to know and understand:

1. the specific health and safety precautions to be taken to protect yourself and others when conducting the prescribed tests on particular categories of electronic products (such as specific legislation or regulations governing the activities or work area, safe working practices and procedures to be adopted, general workshop safety practice, erection of protective barriers, displaying of warning notices)
2. the personal protective equipment (PPE) to be worn whilst carrying out the testing activities concerned, both for personal protection and protection of the components or circuits (such as protective clothing, eye and hearing protection, anti-static devices)
3. the hazards associated with the tests being conducted (such as heat, radiation, chemicals, static electricity, high voltage points on equipment exposed to contact during tests, trapping points on equipment), and how they can be minimised
4. how to obtain the necessary authority to conduct testing, the relevant work areas, and any specific permit-to-work procedures that are used
5. what constitutes a hazardous voltage and how to recognise victims of electric shock
6. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber mating and isolating transformers)
7. the clean work area protocols that should be used (in appropriate cases)
8. how to obtain and use data/specifications for the post-production tests being undertaken
9. how to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, current wiring regulations, and other documents needed in the testing activities
10. the use of relevant standards in determining if components and products are fit for purpose
11. the general principles of quality assurance systems and procedures
12. preparations to be undertaken before the product is inspected and tested
13. how to recognise and read component values and, where appropriate, the polarity of electronic components
14. types of test equipment to be used, and their selection for particular types of

tests

15. how to ensure that the test equipment is maintained and correctly calibrated, in accordance with the appropriate organisational procedures

16. how to set up and use the range of test equipment items needed for the tests (such as logic and waveform analysis equipment, storage oscilloscopes, signal generators, sensing and measuring devices, current, voltage and impedance measuring instruments)

17. the importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits

18. the importance of using the appropriate test points in the circuit, and how these are identified

19. the types of test used to verify the correct functioning of electronic equipment

20. why sampling is used, and when it is an effective means of quality assurance

21. the basic operating principles of the electronic components/circuits being tested

22. how to analyse and evaluate the results of the tests carried out

23. problems or errors that could occur and which may affect the test results, and how they can be avoided

24. the typical defects and variations that can be found on the electronic products, and how to identify them

25. the importance of completing inspection documentation, what needs to be recorded and where records are kept

26.
the procedure to be followed when inspected products are out of specification

27.
the extent of your own responsibility, and whom you should report to if you have problems that you cannot resolve during testing of the electronic equipment

Scope/range

1.

Carry out all of the following during the testing of the electronic products:

1.1 obtain and use the correct issue of company and/or manufacturers' drawings and testing documentation
1.2 adhere to risk assessment, COSHH and other relevant safety standards
1.3 follow clean work area protocols, where appropriate
1.4 check that test equipment is correctly calibrated and appropriate for test(s) to be carried out
1.5 use grounded wrist straps and other electrostatic discharge (ESD) precautions, as appropriate
1.6 provide safe access and working arrangements for the testing area
1.7 carry out the inspection and testing activities, using appropriate techniques and procedures
1.8 operate test equipment within its specification range
1.9 apply adjustment of inspection results for temperature correction (where applicable)
1.10 identify and record out-of-specification features, in the appropriate format
1.11 report and investigate the possibility of gaining a concession for out-of-specification products
1.12 place products in the correct location on completion of the inspection activities (in and out of specification)
1.13 leave the work area in a safe and tidy condition on completion of the activities

2.

Test one of the following manufactured electronic products:

2.1 printed circuit board assemblies
2.2 visual display screens
2.3 microwave components
2.4 electronic assemblies
2.5 electronic modules/sub-assemblies
2.6 power supplies (such as switched mode, series regulation, parallel regulation)
2.7 motor control systems (such as closed loop servo and proportional control, solid state, inverter control)
2.8 sensor/actuator equipment (such as linear, temperature, photo-optic, flow, rotational, level, pressure, mass/weight)
2.9 digital devices (such as process control, microprocessor-based, logic devices, display devices)
2.10 signal generating/processing equipment (such as frequency modulating/demodulating, oscillators, amplifiers, filters)
2.11 alarms and protection devices
2.12 ADC and DAC hybrid circuits and equipment

2.13 other specific electronic product

3.

Carry out two of the following inspection procedures:

3.1 first/one-off
3.2 in-process/sample
3.3 final inspection

4.

Carry out visual inspection of electronic products, to include ensuring all of the following:

4.1 all manufacturing/assembly procedures are complete
4.2 all components are correctly assembled and orientated
4.3 all connections are mechanically secure
4.4 soldered joints are free from excess solder and flux residue
4.5 products are free from damage or obvious defects

5.

Use technical information to assist in the inspection and testing activities, by referring to three of the following:

5.1 technical manuals
5.2 logic diagrams
5.3 flow charts/fault algorithms
5.4 fault finding/troubleshooting guides
5.5 organisational technical files

6.

Carry out tests using four of following tools and test equipment:

6.1 oscilloscope
6.2 ammeter
6.3 signal generator
6.4 Q meter
6.5 multimeter
6.6 signal tracer
6.7 continuity tester
6.8 automatic test equipment
6.9 measuring instrument or gauge
6.10 pulse sequencing analyser
6.11 computer aided diagnostic equipment
6.12 spectrum analyser
6.13 recording devices (such as shock, vibration, humidity, temperature)
6.14 network analyser
6.15 computer-aided diagnostic equipment
6.16 logic probe/analyser
6.17 special purpose testing equipment
6.18 non-contact wafer testing
6.19 other specific test equipment

7.

Carry out four of the following tests:

7.1 pulse train sequencing and pulse width/rise time
7.2 waveform shape/frequency and amplitude checks
7.3 frequency modulation/demodulation
7.4 signal noise/interference levels
7.5 logic states
7.6 DC voltage/current levels
7.7 AC voltage/current levels
7.8 clock/timer switching
7.9 component value tests (such as resistance, capacitance, inductance)
7.10 continuity, open and short circuit tests
7.11 shock and vibration withstand tests
7.12 humidity, temperature and damp tests
7.13 insulation resistance
7.14 heat dissipation
7.15 edge bead
7.16 trench depth
7.17 other specific tests

8.

Carry out tests which comply with one of the following standards:

8.1 BS or ISO standards and procedures
8.2 customer standards and requirements
8.3 organisation standards and procedures
8.4 other international standards
8.5 statutory regulations
8.6 specific system requirements

9.

Complete the relevant paperwork, using one of the following, and pass to the appropriate person:

9.1 inspection report
9.2 customer specific documentation
9.3 concession report
9.4 job card

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