
Overview

This standard identifies the competences you need to carry out inspections and tests on marine electrical equipment and electronic circuits, such as single, three-phase and direct current power supplies and control systems, motors and starters, switchgear and distribution panels, control systems, communication systems, weapon systems, navigation systems, sensor systems, computer control systems, lighting and alarm systems, electrical plant, luminaires and domestic electrically powered equipment, in accordance with approved procedures. You will be required to carry out formal inspections and tests, which will include protective insulation and resistance values, load current, voltage levels and power ratings, on a range of electrical/electronic equipment, to establish that it is functioning at optimal level and to specification.

Your responsibilities will require you to comply with organisational policy and procedures for the testing activities undertaken and to report any problems with these 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 sound understanding of your work and will provide an informed approach to applying test procedures to marine electrical/electronic equipment and circuits. You will understand the equipment being worked on, the test equipment to be used and the various testing procedures, in adequate depth to provide a sound basis for carrying out the activities to the required specification. In addition, you will be expected to review the outcome of the tests, to compare the results with appropriate units, to determine the action required and to record and report the results in the appropriate format.

You will understand the safety precautions required when carrying out the inspection and testing activities, especially those for isolating the equipment and for taking the necessary safeguards to protect yourself against direct and indirect electric shock. 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 appropriate procedures for use of tools and equipment to carry out the required tests
3. set up and carry out the tests using the correct procedures and within agreed timescales
4. record the results of the tests in the appropriate format
5. review the results to determine the accuracy of the tests and carry out further tests if necessary

Knowledge and understanding

You need to know and understand:

1. the health and safety requirements of the work area where you are carrying out the testing activities and the responsibility they place on you
2. the equipment isolation and lock-off procedure or permit-to-work procedure that applies to the testing activities (electrical isolation, locking off switch gear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured)
3. the specific safety precautions to be taken when carrying out formal inspection and testing of marine electrical/electronic equipment
4. how to recognise and deal with emergencies and the procedures to be followed (such as methods of safely evacuating and closing down of compartments in the case of fire or other major incident, first aid, fire fighting and resuscitation of personnel)
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. what constitutes a hazardous voltage and how to recognise victims of electric shock
7. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
8. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the testing activities
9. protection techniques for electrical systems (to prevent burn or fire risk)
10. how to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, IET wiring regulations and other documents needed in the maintenance process
11. how to carry out currency/issue checks of the specifications you are working with
12. the basic principle of operation of the equipment/circuits being tested and the purpose of individual components within the equipment/ circuit/system
13. the application and use of a range of electrical and electronic components and the likely functions that will require checking
14. types of test equipment to be used and their selection for particular types of tests
15. how to calibrate the test equipment to be used, or the organisational procedures for ensuring that the test equipment is maintained and

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- correctly calibrated
16. how to connect the appropriate test equipment for the measurement of resistance, current, voltage, power, capacitance, inductance, power factor and protective device disconnection/trip times
 17. the various testing methods and procedures, as recommended in approved electrical codes of practice and how to apply them to different operating conditions
 18. displaying/recording test results and the documentation to be used
 19. how to interpret the test readings obtained and the significance of the readings gained
 20. how to analyse test results, using tables in approved electrical codes of practice and using comparison and sequential techniques
 21. the importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits
 22. potential problems or errors that could occur and which may affect the test results and how they can be avoided
 23. the environmental control and company operating procedures relating to the testing activities
 24. the documentation required and the procedures to be followed following the testing activities
 25. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Scope/range related to performance criteria

1. Carry out **all** of the following during the testing activities:
 1. plan the inspection and testing activities to cause minimal disruption to normal working
 2. use the correct issue of vessel/system drawings and maintenance documentation
 3. adhere to risk assessment, COSHH and other relevant safety standards
 4. obtain clearance to work on the system and observe the appropriate power isolation and safety procedures
 5. provide safe access and working arrangements for the maintenance area
 6. carry out the inspection and testing activities, using appropriate techniques and procedures
 7. re-connect and return the system to service on completion of the testing activities
 8. functionally test and adjust equipment to specification
 9. dispose of waste items in a safe and environmentally acceptable manner and leave the work area in the prescribed category of cleanliness

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2. Carry out inspections and tests on **six** of the following types of marine electrical/electronic equipment:
 1. distribution switchgear
 2. wiring systems
 3. electric motors
 4. contactors and relays
 5. control panels
 6. programmable logic control (PLC) systems
 7. power electronic systems
 8. communication
 9. monitoring
 10. navigation
 11. computer
 12. motor drives
 13. sensors
 14. actuators
 15. power, heating and lighting systems
 16. accessories

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3. Carry out tests using a range of tools and test equipment, to include **four** of the following:

1. oscilloscope
2. ohmmeter
3. ammeter
4. insulation resistance tester
5. loop impedance tester
6. residual current device (RCD) tester
7. portable appliance tester (PAT)
8. multimeter
9. voltmeter
10. communication analyser
11. power meter
12. specialist test equipment (such as for sound, speed, light, temperature)

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4. Use appropriate test equipment to carry out **five** of the following tests to the equipment being maintained:

1. protective resistance values
2. insulation resistance values
3. load current
4. voltage levels
5. power rating
6. resistance
7. capacitance
8. frequency values
9. inductance
10. safety device trip speed
11. functional tests
12. voltage standing wave ratio checks
13. specialist tests (such as for speed, sound, light, temperature)

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5. Carry out **all** the following checks to ensure the accuracy and quality of the tests carried out:

1. the test equipment is correctly calibrated
2. test equipment used is appropriate for the tests being carried out
3. test procedures used are as recommended in the appropriate

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- electrical regulations/codes of practice (IET/BS/ISO)
4. test equipment is operated within its specification range

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6. Provide a record/report of the test outcomes, using **one** of the following:

1. preventative maintenance log/report
2. company specific reporting procedure
3. inspection schedule * *
4. specific test report
5. other appropriate recording method

Behaviours

Behaviours:

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

SEMME3023

Testing marine electrical and electronic equipment and circuits



Developed by	Enginuity
Version Number	3
Date Approved	28 Feb 2019
Indicative Review Date	28 Feb 2021
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMME3023
Relevant Occupations	Marine Engineering Trades
Suite	Marine Engineering Suite 3
Keywords	engineering; marine; electrical; electronic; testing; equipment; circuits; power supply; control; motors; starters
