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## Overview

This standard identifies the competences you need to carry out dynamometer tests on overhauled piston engines, such as naturally or mechanically aspirated two-stroke and four-stroke internal combustion engines or compression ignition engines, as appropriate to the engine type, in accordance with approved procedures. You will be required to carry out all necessary preparations to the engine in readiness for the tests to be carried out, and these will include ensuring that the engine is correctly connected to the dynamometer, that all ancillary equipment is fitted to the engine, appropriate blanking plates are fitted, test instrumentation is correctly connected and all necessary electrical checks are carried out.

In carrying out the tests, you will be required to follow laid-down procedures, to ensure that the working area is clear, appropriate guards and notices are displayed, engine runs/tests are carried out in accordance with the appropriate schedule, monitoring procedures are complied with, analysis of results is made, and that test documentation is completed accurately and legibly.

Your responsibilities will require you to comply with organisational policy and procedures for the tests undertaken, and to report any problems with the testing activities 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 undertaking the appropriate piston engine test procedures. You will understand the piston engine being tested, the specific test schedule to be followed, and will know what the various instruments and readings mean, in adequate depth to provide a sound basis for carrying out the tests to the required specification.

You will understand the safety precautions required when carrying out the testing activities, in particular those involved with fuelling and running the engine. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

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## Performance criteria

*You must be able to:*

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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 and analyse the results and carry out further tests if necessary

## Knowledge and understanding

*You need to know and understand:*

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1. how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. the personal protective clothing and equipment (PPE) to be worn during the testing activities
3. the hazards associated with dynamometer testing of piston engines, and how to minimise them and reduce any risks
4. the preparations to be carried out on the engine, prior to starting the engine tests
5. how to obtain the required test schedules and specifications for the piston engine being tested, and how to check their currency and validity
6. how to read and interpret the specifications, and whom you can seek assistance from if you have problems or issues regarding the test schedules or specifications
7. how to access and set up the computer software required to run the engine tests
8. the methods and procedures to be used to carry out the various engine tests
9. the basic principle of operation of the piston engine under test, and the function of the individual components within the system
10. how to carry out initial start-up procedures and checks
11. the need to apply engine power in incremental stages, and to check all readings, temperatures and pressures at each stage
12. how to record the results of each individual test, and the documentation that must be used
13. whom to seek authorisation from if you need to alter or change the test procedures
14. the procedures to be followed if the engine or system fails to meet the test specification
15. how to analyse the test results and make valid decisions about the acceptability of the engine
16. potential problems that can occur with the testing activities, and how they can be overcome
17. items that may cause errors or discrepancies in/with the test results, and how to

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avoid them

18. any environmental controls required relating to the testing
19. documentation to be completed at the end of the testing activities
20. the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

## Scope/range related to performance criteria

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1. Carry out all of the following during the testing activities:
  - 1.1 obtain and use the appropriate documentation for the testing activities
  - 1.2 adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
  - 1.3 use safe and approved testing techniques and procedures
  - 1.4 return all tools and equipment to the correct location on completion of the activities
  - 1.5 leave the engine and work area in a clean and safe condition on completion of the activities
2. Test one of the following types of piston engine:
  - 2.1 two-stroke internal combustion engine
  - 2.2 compression ignition engine
  - 2.3 four-stroke internal combustion engine
3. Prepare the engine for testing and carry out initial start-up checks, to include all of the following, as applicable to the engine type:
  - 3.1 connect the engine correctly to the dynamometer
  - 3.2 fit all required engine ancillary equipment (such as starter motors, slave oil filters, magnetic chip detectors and strainers)
  - 3.3 fit all required environmental equipment (such as forced air fans, exhaust extraction)
  - 3.4 fit blanking plates (where appropriate)
  - 3.5 filling the engine with oil
  - 3.6 make all required connections to the engine (to include fuel connections, electrical and instrumentation)
  - 3.7 carry out all necessary electrical checks, and confirm that the engine is ready for testing
  - 3.8 ensure that all personal are clear of the test facility and that safe working distance procedures are maintained
  - 3.9 load and prepare computer software for operation (where applicable)
  - 3.10 check the engine starting system
  - 3.11 run the engine and check that the engine shutdown system operates correctly
  - 3.12 carry out idle checks
  - 3.13 check that engine oil pressure is satisfactory
  - 3.14 check that fuel flow is operating correctly
  - 3.15 check all oil filters, connections, gaskets and seals for signs of leakage
4. Undertake engine tests as, listed in the appropriate engine test schedule, to

include all of the following:

- 4.1 initiating the engine test sequence
  - 4.2 carrying out running and handling checks
  - 4.3 carrying out performance curves
  - 4.4 carrying out vibration surveys
  - 4.5 checking that engine pressures are within specification
  - 4.6 checking that engine temperature is within specification
  - 4.7 checking that the throttle/high pressure fuel flow operates smoothly
  - 4.8 ensuring that maximum power is achieved
  - 4.9 checking exhaust gases (analysis)
5. Deal with two of the following complexities during the engine tests:
- 5.1 engine runs with no faults
  - 5.2 engine runs with faults
  - 5.3 engines with intermittent faults
6. Disconnect the engine on completion of the testing procedures, to include carrying out all of the following:
- 6.1 shutting down the computer system (where appropriate)
  - 6.2 checking all oil filters, connections, gaskets and seals for signs of leakage
  - 6.3 removing and checking magnetic chip detectors for contamination
  - 6.4 removing and checking slave filters for contamination
  - 6.5 installing the engine's own magnetic chip detectors and filters
  - 6.6 draining all oil and fuel from the engine
  - 6.7 removing all fitted blanks and instrumentation
  - 6.8 removing the engine from the dynamometer, safely and correctly
  - 6.9 preparing the engine for passing to the race team/customer
7. Review and analyse the results of the test run, using two of the following:
- 7.1 engine test schedule
  - 7.2 data sheets
  - 7.3 calibration records
  - 7.4 log cards/history sheet
  - 7.5 fault records
  - 7.6 other specific records
8. Carry out tests on overhauled piston engines in compliance with one of the following:
- 8.1 BS, ISO or BSEN standards and procedures
  - 8.2 engine manufacturer's specification
  - 8.3 customer standards and requirements
  - 8.4 company standards and procedures

SEMMME3119

Carrying out tests on overhauled piston engines (fixed dynamometer)



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