

National Unit Specification: General Information

UNIT Automotive: Engine Mechanical (Intermediate 2)

NUMBER 2210218

COURSE

SUMMARY

This unit is designed to develop a knowledge of the internal combustion engine's construction, its cycles of operation and the procedures used to determine component serviceability.

OUTCOMES

- 1 Identify main engine components.
- 2 Explain engine operating cycles.
- 3 Measure main engine components which are subject to wear.
- 4 Explain and calculate from given data engine capacity and compression ratio.
- 5 Demonstrate the procedure for removing and fitting a main engine component.

RECOMMENDED ENTRY

Access to this unit is at the discretion of the centre, however no entry prerequisites are envisaged.

CREDIT VALUE

1 Credit at Intermediate 2.

CORE SKILLS

Information on the automatic certification of any core skills in this unit is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999)

Administrative Information

Superclass: XS

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National unit specification: statement of standards

UNIT Automotive: Engine Mechanical (Intermediate 2)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Identify main engine components.

Performance Criteria

- a) The identification of cylinder head main components is correct.
- b) The identification of cylinder block main components is correct.
- c) The identification of camshaft drive main components is correct.

Evidence Requirements

Written and/or oral evidence is required to show that the candidate can correctly identify from diagrams or actual components, cylinder head, cylinder block, camshaft drive and lubrication system main components,

Satisfactory achievement of the outcome will be based on all performance criteria being met. This will be demonstrated by the candidate producing for:

- PC a) correct identification of 4 cylinder head main components
- PC b) correct identification of 5 cylinder block main components
- PC c) correct identification of 3 camshaft drive main components

OUTCOME 2

Explain engine operating cycles.

Performance Criteria

- a) The explanation of the cycle of operation for 2 and 4 stroke engines is correct.
- b) The explanation of valve/port open and closed periods is correct.
- c) The explanation of a procedure which prevents valve/piston contact during cam drive fitment is correct.

Evidence Requirements

Written and/or oral evidence is required to show that the candidate can correctly explain, using diagrams or engine models, the operating cycles, valve/port open and closed periods, cam drive fitment procedure.

Satisfactory achievement of the outcome will be based on all performance criteria being met. This will be demonstrated by the candidate producing for:

- PC a) correct explanation of 1 two stroke and 1 four stroke engine operating cycle
- PC b) correct explanation of 1 valve or 1 port open and closed period.
- PC c) correct explanation of 1 cam drive fitment procedure

National unit specification: statement of standards (cont)

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OUTCOME 3

Measure main engine components which are subject to wear.

Performance Criteria

- a) The identification of main engine components subject to wear is correct.
- b) The use of measuring equipment/instruments to recommended procedures is correct.
- c) The measurement of main engine components which are subject to wear is correct.

Evidence Requirements

Written and/or oral evidence is required to show that the candidate can correctly identify using diagrams or engine components the main engine components which are subject to wear; use measuring equipment/instruments to recommended procedures and measure selected engine components.

OUTCOME 4

Explain and calculate from data engine capacity and compression ratio.

Performance Criteria

- a) The explanation of the terms engine capacity and compression ratio is correct.
- b) The calculation of engine capacity from given data is correct.
- c) The calculation of engine compression ratio from given data is correct.

Evidence Requirements

Written and/or oral evidence that the candidate can correctly explain the terms 'engine capacity' and 'compression ratio' and carry out appropriate calculations of engine capacity and compression ratio correctly.

Satisfactory achievement of the outcome will be based on all performance criteria being met. This will be demonstrated by the candidate producing for:

- PC a) 1 correct explanation for engine capacity and 1 for compression ratio
- PC b) 1 correct calculation for engine capacity
- PC c) 1 correct calculation for compression ratio

National unit specification: statement of standards (cont)

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OUTCOME 5

Demonstrate the procedure for removing and fitting a main engine component.

Performance Criteria

- a) The tools/equipment are used in accordance with manufacturer's or company's set procedures.
- b) The removal and fitting of the component is carried out correctly.
- c) The torque setting to set specifications for the given task is carried out correctly.
- d) The alignment of components is correct.
- e) The relevant safety requirements are correctly adhered to for the given task.

Evidence Requirements

Evidence of actual performance of the candidate's ability to follow instructions (manufacturer's or company set procedures), use tools, observe relevant/set safety requirements for the given task and meet set time scales within defined criteria.

National unit specification: support notes

UNIT Automotive: Engine Mechanical (Intermediate 2)

This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

GUIDANCE ON CONTENT AND CONTEXT

This unit is designed to operate in conjunction with the SVQ Level II Vehicle Mechanical: Unit Replacement, building the underpinning theory which will assist in the attainment of the SVQ, the PDA Certificate in Motor Vehicle Systems, Intermediate 2 of the Higher Still Programme or as a freestanding unit.

Outcome 1

Cylinder block – construction; the crankcase; cylinder block materials;
Cylinder liners: - wet; dry; removal and replacement of press fit liners;
Cylinder head: - construction; materials; tightening down procedures;
Crankshaft: - construction; balance weights; oil hole drillings; journal bearings;
Con rod: - construction; materials; design
Friction and heat distribution from components
Valves: - poppet valve; poppet valve materials; valve guides; valve compression return spring; valve rotators.
Camshaft Drives: belts, tensioners, chains, gears.

Outcome 2

2 and 4 stroke operating cycles;
Valve timing: - valve lead; valve lag; valve overlap; valve timing diagrams;
Combustion chamber: - design.
Valve/port opening and closing periods.

Outcome 3

Included could be in-depth investigation of units, procedures to check for wear, systematic approaches for identification of faults, the use of measuring devices eg. depth gauge, internal and external micrometers, vernier calliper, feeler gauges, oil pressure gauge and compression leakage tester.

Outcome 4

Engine capacity; compression ratio; clearance volume; calculations using given formula – from swept volume and clearance volume; calculations using given formula – from swept volume and clearance volume calculate compression ratio for the total.

National unit specification: support notes (cont)

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Outcome 5

This is a practical exercise where the candidate will be able to demonstrate his competence in the removal and fitting of a main engine component.

GUIDANCE ON TEACHING AND LEARNING APPROACHES

The unit should be taught in a practical and classroom situation with access to a suitable range of engines preferably in a used condition. Some expendable units should be made available on which candidates can practice before working on useable units. It would also be advantageous and useful to show different engine configurations.

Candidates should be made aware of any special service or assembly features of units or components.

Workshop manuals, parts list and special tools should be made available and any other relevant information required for the task.

GUIDANCE ON APPROACHES TO ASSESSMENT

Tutors/trainers should use an Instrument of Assessment appropriate to the type of evidence required. Examples of Instruments of Assessment which could be used are as follows:

Outcome 1

Written and/or oral evidence which may be in the form of multi-choice type questions, a matching exercise, from diagrams slides, video or actual units/vehicles, which allows the candidate to identify main engine components.

Outcome 2

Written and/or oral evidence which may be in the form of multi-choice type questions. Short answer or gapped responses could be used which allows the candidate to explain engine operating cycles.

Outcome 3

This is a practical exercise where the candidate will be able to demonstrate his competence in using measuring equipment and measuring engine components.

Outcome 4

The candidate should attain 2 restricted response answers for PC (a) and make 2 accurate calculation 3 from the data given for PC(b) and (c).

Outcome 5

This is a practical exercise where the candidate will be able to demonstrate his competence in the removal and fitting of a main engine component.