



Higher National Unit specification

General information for centres

Unit title: Automotive Engineering: Braking Systems and Vehicle Stability Control

Unit code: F53V 34

Unit purpose: This Unit will provide knowledge and understanding of advanced automotive safety braking and vehicle stability systems, introduce the concept of systems interaction and allow candidates to apply test procedures to electric/electronic systems to determine their serviceability. The Unit is intended for candidates who have an existing knowledge of electrical and hydraulic systems and how these are managed and operated.

On completion of the Unit the candidate should be able to:

- 1 Explain the main functions and operation of an anti-lock braking system.
- 2 Explain the main functions and operation of an electro-hydraulic braking system.
- 3 Explain the main functions and operation of a vehicle stability system.

Credit points and level: 2 HN credits at SCQF level 7: (16 SCQF credit points at SCQF level 7*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: While entry to this Unit will be at the discretion of the centre, it is recommended that candidates have prior knowledge of Vehicle Electrical Systems, for example at SVQ level 3 or equivalent. It is also recommended that candidates have first completed or are working towards the HN Unit Electrical and Electronic Principles and Ancillary Systems.

Core Skills: There are opportunities to develop the Core Skill of *Communication* at SCQF level 5 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: The Unit could be assessed by a combination of extended response and practical exercises. All Outcomes could be integrated, or each assessed individually. It is recommended that each part of the Unit be assessed on an ongoing basis. A report of approximately 500 words or equivalent per Outcome could act as a guide for the sufficiency of evidence. Where Outcomes are integrated, a combined report of approximately 1,200 words or equivalent would be sufficient.

Higher National Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain the main functions and operation of an anti-lock braking system

Knowledge and/or Skills

- ◆ System operation
- ◆ Component construction and operation
- ◆ Diagnostic equipment and procedures
- ◆ Health and safety procedures

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain the functions of the Electronic Control Unit (ECU) in system operation, in all modes (this must cover input, decode, process, output)
- ◆ explain sensor construction and operation (this must cover hall and inductive); and actuator construction and operation (this must cover valve body, pump, accumulator)
- ◆ produce schematic/graphical diagrams and annotate to show the flow of fluid through the Anti-lock Braking System (ABS) when a wheel or wheels begin to lock up
- ◆ identify and record a system fault using diagnostic equipment and procedures
- ◆ apply appropriate health and safety procedures

Assessment Guidelines

This Outcome could be individually assessed by a report of approximately 500 words or equivalent, and a practical task with the aid of an observation checklist. Outcomes 1, 2 and 3 could be integrated, with a combined report of approximately 1,200 words or equivalent.

Higher National Unit specification: statement of standards (cont)

Unit title: Automotive Engineering: Braking Systems and Vehicle Stability Control

Outcome 2

Explain the main functions and operation of an electro-hydraulic braking system

Knowledge and/or Skills

- ◆ System operation
- ◆ Component construction and operation
- ◆ Systems interaction

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain the functions of the ECU in system operation, in all modes (this must cover input, decode, process, output)
- ◆ explain sensor construction and operation (this must cover hall and inductive); and actuator construction and operation (this must cover valve body, pump, accumulator, master cylinder)
- ◆ explain the flow of fluid through the electro-hydraulic braking system when systems interact, and produce schematic/graphical diagrams and annotate to illustrate this

Assessment Guidelines

This Outcome could be individually assessed by a report of approximately 500 words or equivalent. The system explained could be Brake Assistant (BA) or Sensotronic Brake Control (SBC) etc. Outcomes 1, 2 and 3 could be integrated, with a combined report of approximately 1,200 words or equivalent.

Higher National Unit specification: statement of standards (cont)

Unit title: Automotive Engineering: Braking Systems and Vehicle Stability Control

Outcome 3

Explain the main functions and operation of a vehicle stability system

Knowledge and/or Skills

- ◆ System operation
- ◆ Component construction and operation
- ◆ Systems interaction
- ◆ Diagnostic procedures and equipment
- ◆ Health and safety procedures

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain the function and operation of a vehicle stability system.
- ◆ explain the operation and interaction of the electronic components associated with a vehicle's stability system. This must include sensors, actuators and Electronic Control Unit (ECU).
- ◆ explain the interaction and communication of a vehicle's various Electronic Control Units (ECU)
- ◆ identify and record a system fault using diagnostic procedures and equipment.
- ◆ apply appropriate health and safety procedures.

Assessment Guidelines

This Outcome could be individually assessed by a report of approximately 500 words, and a practical task aided by an observation checklist. The system explained could be Electronic Stability Programme (ESP), Traction Control System (TCS), or similar system. Outcomes 1, 2 and 3 could be integrated, with a combined report of approximately 1,200 words or equivalent.

Administrative Information

Unit code: F53V 34

Unit title: Automotive Engineering: Braking Systems and Vehicle Stability Control

Superclass category: XR

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Higher National Unit specification: support notes

Unit title: Automotive Engineering: Braking Systems and Vehicle Stability Control

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 80 hours.

Guidance on the content and context for this Unit

The candidate should achieve the level of competence required of someone who seeks to be able to determine the operating characteristics and evaluate the operation and application of advanced braking systems and vehicle stability control. The Unit should be taught in the context of light vehicle applications.

Where candidates are asked to apply appropriate health and safety procedures, these will relate to the practical element of the particular Outcome.

Outcomes 1 and 2

These Outcomes give a broad introduction to the operation and functions of auxiliary braking systems. The candidates should also be able to understand the interaction of different vehicle systems, as used during a variety of road conditions.

In Outcomes 1 and 2, candidates' explanations of the operation of the ECU within the particular system should give a broad overview of the ECU's general operation within the system, without going into major depth of the ECU's internal components. More complex explanation of the general operation of the ECU components could be covered at SCQF level 8.

Where candidates are asked to produce schematic/graphical diagrams to show the flow of fluid through the Anti-lock Braking System (ABS) and the Electro-Hydraulic Braking system (EHB) they should be sourced, for example, from manufacturer's information, manuals, etc. There is no requirement to draw a detailed diagram from scratch.

Where asked to identify and record a system fault, these could include any general faults such as in sensors, corroded reductors, inductive sensors, etc.

Outcome 3

This Outcome introduces the candidate to vehicle stability control and how this can affect a vehicle's road handling during various road conditions. The candidates should also be able to understand the interaction of different vehicle systems and how these can alter and affect traction and vehicle stability.

The practical elements of Outcomes 1 and 3 should be delivered in an automotive workshop that has sufficient vehicles or systems that enable candidates to carry out the required practical diagnostic tests. It is very important that the relevant data/procedures are available to enable candidates to acquire the salient test procedures.

Higher National Unit specification: support notes (cont)

Unit title: Automotive Engineering: Braking Systems and Vehicle Stability Control

In Outcome 3, candidates' explanations of the operation of the ECU within a vehicle stability system should give a broad overview of the ECU's general operation within the system, without going into major depth of the ECU's internal components. More complex explanation of the general operation of the ECU components could be covered at SCQF level 8.

Where asked to explain the interaction and communication of a vehicle's various Electronic Control Units (ECU), this could include engine management, active suspension, electronic gearbox control, electronic steering control.

Guidance on the delivery and assessment of this Unit

It is strongly recommended that this Unit is delivered and assessed with other Units in the HN Automotive Engineering framework, if undertaken as part of the Group Award, although this Unit can also be taken as a free-standing Unit. It is recommended that where possible an integrative approach should be taken when completing the assessments for these Group Awards.

This integrative approach may be demonstrated in this Unit by integrating it with Automotive Engineering: Steering and Suspension Systems.

Opportunities for developing Core Skills

The delivery and assessment of this Unit may contribute towards the Core Skill of *Communication* at SCQF level 5.

The general skills of the Written Communication component are 'read, understand and evaluate written communication' for its reading element and 'produce well-structured written communication' for its written element. Specific reading skills required by candidates at SCQF level 5 include identifying and summarising significant information, ideas and supporting details in a written communication, and evaluation of the effectiveness of the communication in meeting its purpose; and specific writing skills include 'presenting all essential ideas, information and supporting detail in a logical and effective order, and use of a structure which takes account of purpose and audience, emphasising the main points.

Candidates may need to utilise these skills throughout the Unit, such as when explaining the main functions and operation of an electro-hydraulic braking system in Outcome 2. Candidates may be asked to produce a report explaining these functions, and may be asked to complete reports for each Outcome.

Depending on assessment instruments used, candidates may develop the Oral Communication component to SCQF level 5, if for example, delivering an oral presentation on topics such as systems operation and interaction.

Open learning

This Unit could be delivered by distance learning, however this would require planning by the centre to ensure the sufficiency and authenticity of candidate evidence. Completion of this Unit also requires access to specialised equipment. The practical aspects and equipment required (it should be delivered in a workshop environment) may engender some difficulties in delivering via Open Learning.

Higher National Unit specification: support notes (cont)

Unit title: Automotive Engineering: Braking Systems and Vehicle Stability Control

Candidates with disabilities and/or additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (www.sqa.org.uk).

General information for candidates

Unit title: Automotive Engineering: Braking Systems and Vehicle Stability Control

This Unit will provide you with knowledge and understanding of advanced automotive safety braking and vehicle stability systems. This Unit introduces the concept of systems interaction and allows you to apply test procedures to electric/electronic systems to determine their serviceability. It would be beneficial if prior to undertaking this Unit, you have an existing knowledge of electrical and hydraulic systems and how these are managed and operated.

On completion of the Unit you will be able to:

- 1 Explain the main functions and operation of an anti-lock braking system.
- 2 Explain the main functions and operation of an electro-hydraulic braking system.
- 3 Explain the main functions and operation of a vehicle stability system.

This Unit will allow you to achieve the level of competence required to determine the operating characteristics and evaluate the operation and application of advanced braking systems and vehicle stability control.

Outcomes 1 and 2

Outcomes 1 and 2 will give you a broad introduction to the operation and functions of auxiliary braking systems and develop understanding of the interaction of different vehicle systems.

Outcome 3

This Outcome will introduce you to vehicle stability control and how this can affect a vehicle's road handling during various road conditions. You will also develop understanding of the interaction of different vehicle systems and how these can alter and affect traction and vehicle stability.

The practical elements of this Unit will be delivered in an automotive workshop, enabling you to carry out the required practical diagnostic tests.

During the course of this Unit, there may be opportunities to develop the Core Skill of *Communication*.