SQA Advanced Graded Unit Specification

General Information for Centres

This Graded Unit has been validated as part of the SQA Advanced Certificate/SQA Advanced Diploma in Measurement and Control Engineering. Centres are required to develop the assessment instrument in accordance with this validated specification. Centres wishing to use another type of Graded Unit or assessment instrument are required to submit proposals detailing the justification for change for validation.

Graded Unit Title: Measurement and Control Engineering: Graded Unit 1

Graded Unit Code: HV5Y 47

Type of Graded Unit: Examination

Assessment Instrument: Closed-book examination

Credit points and level: 1 SQA Credit at SCQF level 7: (8 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 National 1 to Doctorates.*

Purpose: This Graded Unit is designed to provide evidence that the candidate has achieved the following principal aims of the SQA Advanced Certificate in Measurement and Control Engineering:

- develop knowledge, understanding and skills in a range of core measurement, instrumentation and control principles at SQA Advanced level
- develop candidates' ability to apply analysis and synthesis skills to the solution of measurement and control problems
- develop learning and transferable skills (including Core Skills)
- develop a range of Communication knowledge and skills relevant to the needs of measurement and control incorporated engineers
- develop and apply a range of integrative competences in measurement and control engineering

Recommended Prior Knowledge and Skills: It is recommended that the candidate should have completed or be in the process of completing the following Units relating to these specific aims prior to undertaking this Graded Unit:

HV63 47	Distributed Control Systems
HV67 47	Measurement Systems 1
HP48 46	Mathematics for Engineering 1
HP75 47	Communications: Business Communication

Core Skills: There are no Core Skills embedded in this Graded Unit specification.
However, there may be opportunities to develop the Core Skills of Written Communication (Writing), Written Communication (Reading), Using Information Technology, Using Graphical Information, Using Number, Problem Solving (Critical Thinking) and Problem Solving (Planning and Organisation) and Working with Others at SCQF level 5.

Assessment: This examination-based Graded Unit is a closed-book assessment**.** It will consist of an examination including a case study and questions of three hours duration.

The case study and questions will be unseen until the time of the exam.

To achieve this Unit, candidates should attain a total of 50% of the available marks with at least 20% of those marks from the case study and at least 30% from the questions.

Achievement being graded according to marks attained.

Administrative information

Graded Unit Code: HV5Y 47

Graded Unit Title: Measurement and Control Engineering: Graded Unit 1

Original date of publication: November 2017

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History of Changes:

Version	Description of change	Date

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

Graded Unit specification: Instructions for designing the assessment task and assessing candidates

Graded Unit Title: Measurement and Control Engineering: Graded Unit 1

Conditions of Assessment

The assessment is based on a closed-book examination lasting three hours.

The examination will consist of a 40 mark case study on a Measurement and Control Engineering System and six 20 mark questions with candidates required to answer any three of the six questions.

If a candidate does not achieve a pass or if a candidate wishes to retake the Graded Unit examination, this must be based on a significantly different examination from that given originally. A candidate's grade will be based on his/her achievement on the new event using a significantly different examination.

The examination should be unseen and the assessment should be conducted in controlled and invigilated conditions. The case study will be given to the candidate at the time of assessment. The case study will be based on a Measurement and Control Engineering System as used in industry. The candidate will be required to analyse a given specification for a Measurement and Control Engineering System and produce a report of 500 words minimum detailing improvements that could be made to the system. The candidate must justify the changes suggested.

At all times, the security, integrity and confidentiality of examinations must be ensured.

Instructions for designing the assessment task:

The examination should be designed to assess the candidate's critical knowledge and understanding of the topics relating to the specific aims which this Graded Unit is designed to cover. The questions and corresponding marks should be designed in accordance with the ranges indicated in the table that follows. However, the overall total mark for the examination is 100.

The case study should be based on a realistic or actual Measurement and Control Engineering System in need of upgrading. A possible example could be a level control system using a displacer with pneumatic transmitter and a pneumatic controller. The system chosen must be familiar to the candidate either through practical experience or through prior knowledge gained throughout the course.

Key Topics	Level of demand	Percentage weighting for each topic
Distributed Control Systems (DCS)	Explain the applications of DCSs Compare DCS with conventional control systems Explain interfacing to a DCS	50% (20 marks)

Key Topics	Level of demand	Percentage weighting for each topic
Measurement Systems	Select suitable devices for given situations Explain the operation of measurement devices	50% (20 marks)

The structure of the examination paper should take the following format:

A case study on a Measurement and Control Engineering System followed by:

- two questions on Distributed Control Systems
- two questions on Measurement Systems
- two questions on Distributed Control Systems and Measurement Systems

The structure of each question should take the following structure:

Knowledge and understanding	5 marks
Applications	10 marks
Analysis and synthesis	5 marks

The examination will be marked out of 100.

The candidate must achieve 20 out of 40 marks for the case study and 30 out of 60 marks for the questions.

Assessors will aggregate the marks achieved by the candidate to arrive at an overall mark for the examination.

Assessors will then assign a grade to the candidate for this Graded Unit based on the following grade boundaries:

- A = 70% – 100%
- B = 60% – 69%
- C = 50% – 59%

Candidates who meet the minimum Evidence Requirements will have their achievement graded as a C (competent), A (highly competent), or B (somewhere between A and C). The grade-related criteria to be used to judge candidate performance for this Graded Unit is specified in the following table:

Grade-related criteria	
Grade A	**Grade C**
Is a seamless, coherent piece of work or exam script which consistently: ♦ Explicitly addresses the main elements of the question ♦ Consistent and precise use of relevant terminology ♦ Responses have a logical structure and are coherently expressed ♦ Demonstrates integration of different aspects of measurement and control engineering ♦ Demonstrates understanding of the use of Distributed Control Systems ♦ Demonstrates understanding and comparison of measurement devices	Is a co-ordinated piece of work or exam script which: ♦ Recognition of the main elements of the question ♦ Uses some relevant terminology but in a vague manner ♦ Responses lack a coherent structure and may be repetitive ♦ Demonstrates understanding of measurement and control engineering ♦ Demonstrates understanding of Distributed Control Systems ♦ Demonstrates understanding of operation of measurement devices

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.