

# Higher National Graded Unit Specification

## General Information for Centres

This Graded Unit has been validated as part of the HNC/HND 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:** F013 34

**Type of Graded Unit:** Examination

**Assessment Instrument:** Closed-book examination

**Credit points and level:** 1 HN Credit(s) 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 HNC Measurement and Control Engineering:

- ◆ develop knowledge, understanding and skills in a range of core measurement, instrumentation and control principles at Higher National 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:

DX48 34	Distributed Control Systems
DX4F 34	Measurement Systems 1
DG4H 33	Mathematics for Engineering 1: Electronics and Electrical
DE3N 34	Communications: Analysing and Presenting Complex Communication

## General Information for Centres (cont)

**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:** F013 34

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

**Original date of publication:** July 2006

**Version:** 02

### History of Changes:

Version	Description of change	Date
02	Update of Conditions of Assessment	02/08/18

**Source:** SQA

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**FURTHER INFORMATION:** Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000.

## **Higher National 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.

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.

Reasonable assistance is the term used by SQA to describe the difference between providing candidates with some direction to generate the required evidence for assessment and providing too much support, which would compromise the integrity of the assessment. Reasonable assistance is part of all learning and teaching processes. In relation to the assessment of Higher National Examination-based Graded Units, assessors may provide advice and guidance on examination technique and clarification on the meaning of command words which may appear within an examination paper, prior to the formal examination.

Remediation is not allowed in Examination-based Graded Unit assessments.

Any candidate who has failed their Higher National Examination-based Graded Unit or wishes to upgrade their award must be given a re-assessment opportunity, or in exceptional circumstances, two re-assessment opportunities. This must be done by using a substantially different examination.

The final grading given must reflect the quality of the candidate's evidence at the time of the completion of the graded unit. Candidates must be awarded the highest grade achieved, whether through first sitting or through any re-assessment.

### **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.

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

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)
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%

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

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 A	Grade C
<p>Is a seamless, coherent piece of work or exam script which consistently:</p> <ul style="list-style-type: none"><li>◆ Explicitly addresses the main elements of the question</li><li>◆ Consistent and precise use of relevant terminology</li><li>◆ Responses have a logical structure and are coherently expressed</li><li>◆ Demonstrates integration of different aspects of measurement and control engineering</li><li>◆ Demonstrates understanding of the use of Distributed Control Systems</li><li>◆ Demonstrates understanding and comparison of measurement devices</li></ul>	<p>Is a co-ordinated piece of work or exam script which:</p> <ul style="list-style-type: none"><li>◆ Recognition of the main elements of the question</li><li>◆ Uses some relevant terminology but in a vague manner</li><li>◆ Responses lack a coherent structure and may be repetitive</li><li>◆ Demonstrates understanding of measurement and control engineering</li><li>◆ Demonstrates understanding of Distributed Control Systems</li><li>◆ Demonstrates understanding of operation of measurement devices</li></ul>

## Equality and inclusion

This graded 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](http://www.sqa.org.uk/assessmentarrangements).