

**-SQA- SCOTTISH QUALIFICATIONS AUTHORITY**

**HIGHER NATIONAL UNIT SPECIFICATION**

**GENERAL INFORMATION**

|   |   |
|---|---|
| <b>Unit Number</b>                              | <b>D3R3 04</b>                          |
| <b>Unit Title</b>                               | <b>MEASUREMENT OF PROCESS VARIABLES</b> |
| <b>Superclass Category</b>                      | <b>WD</b>                               |
| <b>Date of Publication<br/>(month and year)</b> |   |
| <b>Originating Centre for Unit</b>              | <b>Cleveland Open Learning Unit</b>     |

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**DESCRIPTION**

**GENERAL COMPETENCE FOR UNIT:**

Analysing the operation of measuring instruments.

**OUTCOMES:**

1. analyse the operation of pressure measuring instruments;
2. analyse the operation of level measuring instruments;
3. analyse the operation of flow measuring systems;
4. analyse the operation of temperature measuring instruments.

**CREDIT VALUE:** 2 HN Credits

**ACCESS STATEMENT:**

Access to this unit is at the discretion of the centre. However, it would be beneficial if the student had competence in basic instrumentation systems and mathematics. This may be evidenced by possession of National Certificates in industrial instrumentation (or relevant experience) and mathematics or qualifications of a similar level.

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Additional copies of this unit can be obtained from: The Administrative Services Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ (Tel: 0141-242 2166).

At the time of publication, the cost is £2.50 (minimum order £5.00)

## HIGHER NATIONAL UNIT SPECIFICATION

### STATEMENT OF STANDARDS

#### Unit Number

#### Unit Title

MEASUREMENT OF PROCESS VARIABLES

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

#### OUTCOME

##### 1. ANALYSE THE OPERATION OF PRESSURE MEASURING INSTRUMENTS

#### PERFORMANCE CRITERIA

- (a) Descriptions of the principles of operation of pressure measuring instruments are correct.
- (b) Selection of pressure measuring instruments is appropriate for given conditions.
- (c) Calculations relating to the operation of pressure measuring instruments are correct.
- (d) Description of the calibration of a pressure measuring instrument is correct.
- (e) Diagnosis of faults in pressure measuring instruments is correct for a given set of symptoms.

#### RANGE STATEMENT

Instruments: manometers; Bourdon tube; diaphragm gauge; pressure regulator.  
Faults: zero error; span error; angularity error.

#### EVIDENCE REQUIREMENTS

- PC (a) & (b) One item of written and/or oral evidence covering the items in the range.
- PC (c) A minimum of four correct calculations.
- PC (d) One item of written and/or oral evidence.
- PC (e) Three items of written and/or oral evidence covering the items in the range.

**OUTCOME**

**2. ANALYSE THE OPERATION OF LEVEL MEASURING INSTRUMENTS**

**PERFORMANCE CRITERIA**

- (a) Descriptions of the principles of operation of level measuring instruments are correct.
- (b) Selection of level measuring instruments is appropriate for given conditions.
- (c) Calculations relating to the operation of level measuring instruments are correct.
- (d) Description of the calibration of a level measuring instrument is correct.
- (e) Diagnosis of faults in level measuring instruments is correct for a given set of symptoms.

**RANGE STATEMENT**

Instruments: sight glass; float gauge; hydrostatic system using differential pressure cell; gas purged dip tube, displacer level gauge; electrical level gauge; load cell.

Faults: mechanical; fluid property changes.

**EVIDENCE REQUIREMENTS**

- PC (a) & (b) One item of written and/or oral evidence covering the items in the range.
- PC (c) One correct calculation for each for each item in the range.
- PC (d) One item of written and/or oral evidence.
- PC (e) One item of written and/or oral evidence covering the items in the range.

**OUTCOME**

**3. ANALYSE THE OPERATION OF FLOW MEASURING SYSTEMS.**

**PERFORMANCE CRITERIA**

- (a) Descriptions of the principles of operation of flow measuring instruments are correct.
- (b) Selection of flow measuring instruments is appropriate for given conditions.
- (c) Calculations relating to the operation of flow measuring instruments are correct.
- (d) Description of the calibration of a flow measuring instrument is correct.
- (e) Diagnosis of faults in flow measuring instruments is correct for a given set of symptoms.

**RANGE STATEMENT**

Instruments: quantity meter; target and turbine flowmeters; electromagnetic differential pressure flowmeter; variable area flowmeter; vortex shedding flowmeter; flow integrator.

Causes of faults: gas wetness; change of temperature; gas solubility; seal level of liquid sealed drum meter.

**EVIDENCE REQUIREMENTS**

- PC (a) & (b) One item of written and/or oral evidence covering the items in the range.
- PC (c) One correct calculation for each for each item in the range.
- PC (d) One item of written and/or oral evidence.
- PC (e) One item of written and/or oral evidence covering the items in the range.

**OUTCOME**

**4. ANALYSE THE OPERATION OF TEMPERATURE MEASURING INSTRUMENTS**

**PERFORMANCE CRITERIA**

- (a) Descriptions of the principles of operation of temperature measuring instruments are correct.
- (b) Selection of temperature measuring instruments is appropriate for given conditions.
- (c) Calculations relating to the operation of temperature measuring instruments are correct.
- (d) Description of the calibration of a temperature measuring instrument is correct.
- (e) Diagnosis of faults in temperature measuring instruments is correct for a given set of symptoms.

**RANGE STATEMENT**

Instruments: liquid in glass; liquid in metal; gas filled thermometer; vapour pressure thermometer; bi-metal thermometer; resistance thermometer; thermocouple; optical pyrometer; radiation pyrometer.

Causes of faults: incorrect range/orientation.

**EVIDENCE REQUIREMENTS**

- PC (a) & (b) One item of written and/or oral evidence covering the items in the range.
- PC (c) One correct calculation for each for each item in the range.
- PC (d) One item of written and/or oral evidence.
- PC (e) One item of written and/or oral evidence covering the items in the range.

**MERIT**

To gain a pass in this unit, a candidate must meet the standards set out in the outcomes, performance criteria, range statements and evidence requirements.

To achieve a merit in this unit, a candidate must demonstrate a superior or more sophisticated level of performance. In this unit this might be shown in one or more of the following ways:

- (a) a consistently high level of understanding of the principles and applications of the instruments given in the range statements.
- (b) relating theory to practice.
- (c) depth of further reading and research.

**ASSESSMENT**

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes.)

Accurate records should be made of the assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

**SPECIAL NEEDS**

Proposals to modify outcomes, range statements or agreed assessment arrangements should be discussed in the first place with the external verifier.

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## **HIGHER NATIONAL UNIT SPECIFICATION**

### **SUPPORT NOTES**

#### **Unit Number**

#### **Unit Title**

MEASUREMENT OF PROCESS VARIABLES

#### **SUPPORT NOTES:**

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

#### **NOTIONAL DESIGN LENGTH:**

SQA allocates a notional design length to a unit on the basis of time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 80 hours. The use of notional design length for programme design and timetabling is advisory only.

#### **ASSESSMENT PROCEDURES**

Centres can use the instruments of assessment that they consider most appropriate.

#### **REFERENCES**

1. Guide to unit writing.
2. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
3. Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
4. For details of other SQA publications, please consult SQA's publications list.

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