No. 876 **23 July 2004**

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Measurement, Control and Instrumentation

Registered by NSB 06, Manufacturing, Engineering and Technology, publishes the following qualification and unit standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the qualification and unit standard. The qualification and unit standard can be accessed via the SAQA web-site at **www.saqa.org.za**. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, Hatfield Forum West, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the unit standards should reach SAQA at the address ***below and no later than 23 August 2004.*** All correspondence should be marked **Standards Setting – SGB for Measurement, Control and Instrumentation** and addressed to

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DR LOFFIE NAUDE
ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:

Further Education and Training Certificate: Measurement, Control and Instrumentation

SAQA QUAL ID	*QUALIFICATION TITLE*		
48919	Further Education and Training Certificate: Measurement, Control and Instrumentation		
SGB NAME	SGB Measurement, Control and Instrumentation		
ABET BAND	*PROVIDER NAME*		
Undefined			
QUALIFICATION CODE	*QUAL TYPE*	*SUBFIELD*	
MET-4-National Certificate	National Certificate	Engineering and Related Design	
MINIMUM CREDITS	*NQF LEVEL*	*QUALIFICATION CLASS*	
160	Level 4	Regular-Unit Stds Based	
SAQA DECISION NUMBER	*REGISTRATION START DATE*	*REGISTRATION END DATE*	

PURPOSE OF THE QUALIFICATION

Qualifying learners will gain competencies that will promote professionalism in this sub field by being able to:
> Maintain instrumentation equipment in a process control loop.
> Apply faultfinding techniques on instrumentation equipment and process control loops.
> Demonstrate an understanding of process communication systems.

Rationale for the qualification

The need for this qualification has been established by this economic sector. This qualification is aimed at learners who wish to enter this field of economic activity as well as learners who are already in this field and have gained experience in this sub field and wish to receive formal recognition of their experience. This qualification serves as a basis for learners who wish to follow this career path and forms the basis for further development.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED TO BE IN PLACE

> This qualification assumes that the candidate has a NQF Level 3 Certificate in Measurement Control and Instrumentation.

Or

The candidate must prove competence in terms of the NQF Level 3 qualification and learning in preparation for this qualification should include the aspects of:
> Language, mathematics, literacy and numeracy.
> Science and Measurement Control and Instrumentation technology.
> Teamwork.
> Dexterity and technical aptitude.

Qualifying candidates will have the ability to:
> Articulate to the level 5 qualification.
> Perform maintenance tasks.

Recognition of Prior Learning

This qualification may be obtained through RPL. The learner should be thoroughly briefed on the mechanism to be used and support and guidance should be provided. Care should be taken that the mechanism used provides the learner with an opportunity to demonstrate competence and is not so onerous as to prevent learners from taking up the RPL option towards gaining a qualification.

QUALIFICATION RULES

N/A

EXIT LEVEL OUTCOMES

1. The ability to maintain process control systems.
2. The ability to maintain Programmable Logic Controllers (PLC).
3. Understand Process Communication Systems.
4. Maintain and support procedures to solve a variety of problems, both familiar and unfamiliar, within a Measurement, Control and Instrumentation field.

ASSOCIATED ASSESSMENT CRITERIA

1.
> Prepare for maintaining process control systems.
> Diagnose faults in process control systems.
> Repair equipment in process control systems.
> Calibrate equipment with an understanding of the quality of measurement in process control systems.
> Establish normal conditions after completion of maintenance.

2.
> Install PLC hardware.
> Diagnose faults on PLC hardware.
> Repair PLC hardware.
> Establish normal conditions after completion.

3.
> Demonstrate an understanding of the hierarchical industrial network structure.
> Demonstrate an understanding of Process Communication protocols, interfaces and mediums.
> Demonstrate an understanding of network addressing.

4.
> Solutions to problems are based on a clear analysis of information gathered through diagnostic procedures.
> Procedures are modified to respond to unfamiliar problems where appropriate.
> Can respond to questions and discuss issues related to familiar and unfamiliar problems arising in the Measurement, Control and Instrumentation field.
> All actions related to problem solving are accurately recorded for future reference.

Integrated assessment

Integrated assessment at the level of the qualification provides an opportunity for learners to show they are able to integrate concepts, actions and ideas achieved across a range of unit standards and contexts. Integrated assessment must evaluate the quality of observable performance as well as the thinking behind the performance.

Some assessment aspects will demand practical demonstration while others may not. In some case inference will be necessary to determine competence depending on the nature and context within which performance takes place.

Since this is a foundational qualification, it is necessary to ensure that the fundamental part of the qualification is also targeted to ensure that while the competence may have been achieved in a particular context, learners are able to apply it in a range of other contexts and for further learning. The assessment should also ensure that all the critical cross-field outcomes have been achieved.

INTERNATIONAL COMPARABILITY

This qualification was compared with the New Zealand Qualifications Authority National Certificate in Industrial Measurement and Control and the Diploma in Instrumentation and Control Engineering registered on the Australian NQF. in terms of specific outcomes, assessment criteria notional hours and degree of difficulty and the qualifications compare favorably.

ARTICULATION OPTIONS

This is the third qualification in a series from NQF level 2 through NQF level 3, 4 and 5. This series of qualifications can articulate directly to learning programmes

and qualifications in the Measurement, Control and Instrumentation field. It also opens the possibility for further learning in the sub-field of Engineering and related design.

MODERATION OPTIONS

> A person assessing a learner or moderating the assessment of a learner against this Qualification must be registered as an assessor with the relevant ETQA

> Any institution offering learning that will enable the achievement if this Qualification must be accredited as a provider with the relevant ETQA.

> Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQAs policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQAs (including professional bodies); and in terms of the moderation guideline.

> Moderation must include both internal and external moderation of assessments at exit points of the qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual unit standards, exit level outcomes as well as the integrated competence described in the qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

All assessors need to be Subject Matter Experts, qualified one level higher and registered with the relevant ETQA.

NOTES

N/A

UNIT STANDARDS
(Note: A blank space after this line means that the qualification is not based on Unit Standards.)

	UNIT STANDARD ID AND TITLE	LEVEL	CREDITS	STATUS
Core	113901 Demonstrate an understanding of process communication systems	Level 4	8	Registered
Core	116042 Maintain process control loops	Level 4	10	Draft - Prep for P Comment
Core	116046 Fault find and repair Equipment associated with Final Control Elements	Level 4	10	Draft - Prep for P Comment
Core	116050 Fault find and repair Level Equipment	Level 4	10	Draft - Prep for P Comment
Core	116052 Fault find and repair Pressure Equipment	Level 4	10	Draft - Prep for P Comment
Core	116056 Fault find and repair Programmable Logic Controllers (PLC's)	Level 4	10	Draft - Prep for P Comment
Core	116068 Fault find and repair Temperature Equipment	Level 4	10	Draft - Prep for P Comment
Core	116082 Fault find and repair Flow Equipment	Level 4	10	Draft - Prep for P Comment
Core	116084 Demonstrate an understanding of the Principles of Process Control Loops	Level 4	10	Draft - Prep for P Comment
Core	116086 Demonstrate an understanding of the factors influencing the quality of measurement	Level 4	3	Draft - Prep for P Comment
Elective	116059 Maintain Specialized Sensing Devices	Level 4	15	Draft - Prep for P Comment
Elective	116061 Fault find and repair Analytical Equipment	Level 4	10	Draft - Prep for P Comment
Fundamental	8968 Accommodate audience and context needs in oral communication	Level 3	5	Registered
Fundamental	8969 Interpret and use information from texts	Level 3	5	Registered
Fundamental	8970 Write texts for a range of communicative contexts	Level 3	5	Registered
Fundamental	8973 Use language and communication in occupational learning programmes	Level 3	5	Registered
Fundamental	7468 Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	2	Registered
Fundamental	7784 Communicate in a business environment	Level 4	6	Reregistered
Fundamental	8974 Engage in sustained oral communication and evaluate spoken texts	Level 4	5	Registered

Fundamental	8975 Read analyse and respond to a variety of texts	Level 4	5	Registered
Fundamental	8976 Write for a wide range of contexts	Level 4	5	Registered
Fundamental	9015 Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	5	Registered
Fundamental	12417 Measure, estimate & calculate physical quantities & explore, critique & prove geometrical relationships in 2 and 3 dimensional space in the life and workplace of adult with increasing responsibilities	Level 4	4	Reregistered
Fundamental	114963 Write a variety of texts in X	Level 4	4	Registered

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 1

Demonstrate an understanding of the Principles of Process Control Loops

SAQA US ID	*UNIT STANDARD TITLE*
116084	Demonstrate an understanding of the Principles of Process Control Loops

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Understand process control loops.

SPECIFIC OUTCOME 2

Understand the control concepts within a loop.

SPECIFIC OUTCOME 3

Interpret and Analyse Process Control Loop Response.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 2

Demonstrate an understanding of the factors influencing the quality of measurement

SAQA US ID	*UNIT STANDARD TITLE*
116086	Demonstrate an understanding of the factors influencing the quality of measurement

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	3

Specific Outcomes:

SPECIFIC OUTCOME 1

Interpret and understand specifications.

SPECIFIC OUTCOME 2

Demonstrate an understanding of the certification process.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 3

Fault find and repair Analytical Equipment

SAQA US ID	*UNIT STANDARD TITLE*
116061	Fault find and repair Analytical Equipment

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Establish conditions for fault finding and repairing Analytical Equipment.

SPECIFIC OUTCOME 2

Diagnose faults in Analytical Equipment.

SPECIFIC OUTCOME 3

Repair Analytical Equipment.

SPECIFIC OUTCOME 4

Establish normal conditions after completion.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 4

Established in terms of Act 58 of 1995

Fault find and repair Equipment associated with Final Control Elements

SAQA US ID	*UNIT STANDARD TITLE*
116046	Fault find and repair Equipment associated with Final Control Elements

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Establish conditions for fault finding and repairing Equipment associated with Final Control Element

SPECIFIC OUTCOME 2

Diagnose faults in Equipment associated with Final Control Elements.

SPECIFIC OUTCOME 3

Repair Equipment associated with Final Control Elements.

SPECIFIC OUTCOME 4

Establish normal conditions after completion.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 5

Fault find and repair Flow Equipment

SAQA US ID	*UNIT STANDARD TITLE*
116082	Fault find and repair Flow Equipment

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Establish conditions for fault finding and repairing Flow Equipment.

SPECIFIC OUTCOME 2

Diagnose faults in Flow Equipment.

SPECIFIC OUTCOME 3

Repair Flow Equipment.

SPECIFIC OUTCOME 4

Establish normal operating conditions after completion.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

Established in terms of Act 58 of 1995

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 6

Fault find and repair Level Equipment

SAQA US ID	*UNIT STANDARD TITLE*
116050	Fault find and repair Level Equipment

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Establish conditions for fault finding and repairing Level Equipment.

SPECIFIC OUTCOME 2

Diagnose faults in Level Equipment.

SPECIFIC OUTCOME 3

Repair Level Equipment.

SPECIFIC OUTCOME 4

Establish normal operating conditions after completion.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 7

Fault find and repair Pressure Equipment

SAQA US ID	*UNIT STANDARD TITLE*
116052	Fault find and repair Pressure Equipment

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Establish conditions for fault finding and repairing Pressure Equipment.

SPECIFIC OUTCOME 2

Diagnose faults in Pressure Equipment.

SPECIFIC OUTCOME 3

Repair Pressure Equipment.

SPECIFIC OUTCOME 4

Establish normal conditions after completion.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

Established in terms of Act 58 of 1995

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 8

Fault find and repair Programmable Logic Controllers (PLC's)

SAQA US ID	*UNIT STANDARD TITLE*
116056	Fault find and repair Programmable Logic Controllers (PLC's)

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Establish conditions for fault finding and repairing PLC Hardware.

SPECIFIC OUTCOME 2

Diagnose faults in PLC Hardware.

SPECIFIC OUTCOME 3

Repair PLC hardware.

SPECIFIC OUTCOME 4

Establish normal operating conditions after completion.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 9

Fault find and repair Temperature Equipment

SAQA US ID	*UNIT STANDARD TITLE*
116068	Fault find and repair Temperature Equipment

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Establish conditions for fault finding and repairing Temperature Equipment.

SPECIFIC OUTCOME 2

Diagnose faults in Temperature Equipment.

SPECIFIC OUTCOME 3

Repair temperature equipment.

SPECIFIC OUTCOME 4

Establish normal operating conditions after completion.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 10

Maintain Specialized Sensing Devices

SAQA US ID	*UNIT STANDARD TITLE*
116059	Maintain Specialized Sensing Devices

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	15

Specific Outcomes:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the principles of specialized sensing devices.

SPECIFIC OUTCOME 2

Plan to maintain specialized sensing devices.

SPECIFIC OUTCOME 3

Remove and install specialized sensing devices.

SPECIFIC OUTCOME 4

Calibrate specialized sensing devices.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD: 11

Maintain process control loops

SAQA US ID	*UNIT STANDARD TITLE*
116042	Maintain process control loops

SGB NAME	*ABET BAND*	*PROVIDER NAME*
SGB Measurement, Control and Instrumentation	Undefined	

FIELD DESCRIPTION	*SUBFIELD DESCRIPTION*
Manufacturing, Engineering and Technology	Engineering and Related Design

UNIT STANDARD CODE	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
MET-ENG-0-SGB MC&I	Regular	Level 4	10

Specific Outcomes:

SPECIFIC OUTCOME 1

Establish conditions for maintaining Process Control Loops.

SPECIFIC OUTCOME 2

Diagnose faults in Process Control Loops.

SPECIFIC OUTCOME 3

Repair equipment in a Process Control Loop.

SPECIFIC OUTCOME 4

Establish normal operating conditions after completion.