No. 85 **30 January 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 unit standard for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the unit standard. The unit standards 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, 1067 Arcadia Street, Hatfield Forum West, Hatfield

Comment on the unit standards should reach SAQA at the address ***below and no later than 1 March 2004.*** All correspondence should be marked **Standards Setting – SGB for Measurement, Control and Instrumentation** and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D Mphuthing
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JOE SAMUELS
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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

National Certificate in Measurement, Control and Instrumentation: Level 3

Field: **Manufacturing, Engineering and Technology**

Sub-field: **Engineering and Related Design**

Level: **3**

Credits: **175**

Issue date

Review date

Rationale

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 an entry level for learners who wish to follow this career path and forms the basis for further development.

Purpose

Qualifying learners will gain competencies that will promote professionalism in this sub field by being able to:

Maintain field instrumentation by using test equipment
Apply electronic principles in the Measurement, Control and Instrumentation environment
Read ,record analyse and report readings/measurements
Calibrate, isolate, de-isolate, install and maintain field instruments.

Access to the qualification

This qualification series recognizes skills knowledge and values relevant to a workplace. It is designed for learners who;

- have acquired the skills and knowledge without attending formal courses or training.
- are part of a learnership / skills programme which integrates structured learning and work experience.
- have attended courses or training sessions and then apply the knowledge and skills gained to activities in the workplace initiatives.
- have full physical mobility as the Measurement, Control and Instrumentation environment is physically demanding.
- do not suffer from colour blindness which will require testing for, in order to safeguard industry and the learner.

Learning assumed to be in place

- This qualification assumes that the candidate has a NQF Level 2 Certificate in Measurement Control and Instrumentation.

or

The candidate must prove competence in terms of the NQF Level 2 qualification and learning in preparation for this qualification should include the aspects of:

- Language and mathematical 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 4 qualification.
- Perform maintenance tasks.

Preamble

Measurement, Control and Instrumentation equipment will refer to flow, temperature, level and pressure field instrumentation. In order to demonstrate an understanding, the learner is given an application, which, if successfully carried out will demonstrate the knowledge component. This application must include the safe handling of the above-mentioned equipment.

Exit Level Outcomes and Assessment Criteria

Exit Level Outcome 1

The ability to plan for and maintain field instruments by using test equipment.

Associated Assessment Criteria

- Demonstrate an understanding of the planning for maintaining field instruments and test equipment
- Demonstrate an understanding of safe working conditions when maintaining field instruments and test equipment.
- Demonstrate an understanding of how to remove and install field instruments.

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- Demonstrate an understanding of how to calibrate field instruments by using test equipment.

Exit Level Outcome 2

The ability to apply electronic principles during the development/design of electronic circuits.

Associated Assessment Criteria

- Plan to construct basic electronic circuit in terms of equipment & components required.
- Construct basic electronic circuits as per electronic schematic diagrams.
- Test and commission the electronic circuits as per design specifications.
- Ensure work place is cleaned and design equipment appropriately stored.

Exit Level Outcome 3

Work effectively with others as a member of a team.
Associated Assessment Criteria

- Demonstrate the ability to communicate with peers and members of supervisory/management levels in spoken or written form.
- Adapt speech to accommodate socio-cultural sensitivities without losing own meaning.
- Organise and present Measurement, Control and Instrumentation information in a focused and coherent manner.
- Relationships with peers and supervisory/management levels are established and functioning.

Exit Level Outcome 4

Basic operation of Programmable Logic Controllers

Associated Assessment Criteria

- Demonstrate an understanding of the input/output peripherals of a programmable logic controller.
- Demonstrate an understanding of field devices interfaced to programmable logic controllers.
- Demonstrate an understanding of the processor in a programmable logic controller.
  Demonstrate an understanding of the back plane and power supply of a programmable logic controller.
- Demonstrate an understanding of the programming terminal.

Associated assessment criteria

The assessment criteria of the qualification are embodied in the Unit Standards. The depths of technical expertise that will be assessed across the various specialist contexts

are clearly articulated in the relevant specific outcomes, assessment criteria and range statements within these unit standards.

International Comparability

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

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.

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.

Articulation Possibilities

This is the second 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.

Accreditation and moderation

- 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 than the level of this qualification and registered with the relevant ETQA

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

National Certificate in Measurement, Control and Instrumentation (NQF level 3)

Classification	Unit Standard Titles	NLRD	Level	Credits	Total
Fundamental	**Communication and Language Studies**				36
	Accommodate audience and context needs in oral communication	8968	3	5	
	Interpret and use information from text	8969	3	5	
	Write text for a range of communicative context	8970	3	5	
	Use the writing process to compose texts required in the business environment	12153	4	5	
	Mathematics and Science				
	Use mathematics to investigate and monitor financial aspects of personal and business issues	9011	3	5	
	Investigate life and work related problems using data and probability	9012	3	5	
	Describe, apply and calculate shape and motion in two and three-dimensional space in different contexts.	9013	3	4	
	Demonstrate understanding of different number bases and measurement units and an awareness of error in the context of relevant calculations	9010	3	2	
	Sub-total				36
Core	Use personal computer operating system.	7548	2	3	103
	Maintain pressure equipment		3	7	
	Maintain temperature equipment		3	7	
	Maintain equipment associated with Final Control Elements		3	7	
	Maintain level equipment		3	7	
	Maintain flow equipment		3	7	
	Demonstrate Fault finding techniques on Field Instrumentation.		3	8	
	Read and interpret instrumentation drawings		3	4	
Core contd.	Select, inspect, use and maintain Measurement, Test and Calibration equipment		3	8	
	Construct & test basic electronic circuits	10270	2	16	
	Construct and test advanced electronic circuits (Digital Electronics)		4	16	
	Demonstrate an understanding of basic programmable logic controllers		3	6	

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Elective	Install, test and maintain a basic hydraulic system		3	10	36
	Install, test and maintain a basic pneumatic system		3	10	
	Maintain recorders		3	7	
	Maintain analytical equipment		3	7	
	Maintain intrinsically safe apparatus	10630	2	2	
	Total				**175**
Total Credits					**Min. of 149 Credits**

TITLE: **Maintain pressure equipment**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Remove, calibrate and install Pressure equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of Pressure measurement

Types of Pressure measurement

Calculations and units of measurement used in Pressure measurement

Physical properties of the product being measured

UNIT STANDARD RANGE

Pressure measurement principles includes but is not limited to strain gauges and capacitance sensors.

The range of pressure equipment includes but is not limited to pressure gauges, pressure switches and pressure indicators.

Maintaining pressure equipment includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate pressure equipment.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of pressure equipment is correctly identified

4. Authorization for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove pressure equipment

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The pressure equipment is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate pressure equipment.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and pressure equipment is correctly prepared for the calibration process

4. The pressure equipment is calibrated within the tolerances specified by the manufactures calibration manuals

5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the pressure equipment.

ASSESSMENT CRITERIA

1 The pressure equipment is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the pressure equipment is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of pressure equipment

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of pressure equipment including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of Pressure equipment and their accessories.

Hazards and preventive precautions associated with Pressure equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty pressure equipment and interpreting job requirements.

TITLE: **Maintain temperature equipment**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

Level: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Maintain Temperature equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of temperature measurement

Types of temperature measurement

Calculations and units of measurement used in temperature measurement

Physical properties of the product being measured

UNIT STANDARD RANGE

Temperature measurement principles includes but is not limited to resistive, radiation, electrical and expansion of liquids.

The range of temperature equipment includes but is not limited to temperature switches, temperature transmitters, temperature gauges, temperature probes.

Maintaining temperature equipment includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate temperature equipment.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of temperature equipment is correctly identified

4. Authorisation for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove temperature equipment

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The temperature equipment is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate temperature equipment.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and temperature equipment is correctly prepared for the calibration process

4. The temperature equipment is calibrated within the tolerances specified by the manufactures calibration manuals

5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the temperature equipment.

ASSESSMENT CRITERIA

1 The temperature equipment is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the temperature equipment is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of temperature equipment

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of temperature equipment including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of temperature equipment and their accessories.

Hazards and preventive precautions associated with temperature equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty temperature equipment and interpreting job requirements.

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Government Gazette

REPUBLIC OF SOUTH AFRICA

Vol. 463 Pretoria 30 January 2004 **No. 25951**

PART 2 OF 2

TITLE: **Maintain Equipment associated with final control elements**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

Level: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Maintain equipment associated with final control elements

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of equipment associated with final control elements

Types of equipment associated with final control elements

Calculations and units of measurement used in equipment associated with final control elements

Physical properties of the product being measured

UNIT STANDARD RANGE

Final control element principles includes but is not limited to Pneumatic, Electric and Hydraulic actuated valves, Power cylinders, Pneumatic or Current converters

The range of equipment associated with final control elements includes any device that changes the value of the measured variable including the associated control elements.

Maintaining equipment associated with final control elements includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate equipment associated with final control elements.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of equipment associated with final control elements is correctly identified

4. Authorization for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove equipment associated with final control elements

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The equipment associated with final control elements is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate equipment associated with final control elements.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and equipment associated with final control elements is correctly prepared for the calibration process

4. The equipment associated with final control elements is calibrated within the tolerances specified by the manufactures calibration manuals

5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the equipment associated with final control elements.

ASSESSMENT CRITERIA

1 The equipment associated with final control elements is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the equipment associated with final control elements is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of equipment associated with final control elements

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of equipment associated with final control elements including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of equipment associated with final control elements and their accessories.

Hazards and preventive precautions associated with equipment associated with final control elements.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty equipment associated with final control elements and interpreting job requirements.

TITLE: **Maintain level equipment**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Maintain Level equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of level measurement

Types of level measurement

Calculations and units of measurement used in level measurement

Physical properties of the product being measured

UNIT STANDARD RANGE

Level measurement principles includes but is not limited to pressure, ultrasonic, radar, optical, nuclear.

The range of level equipment includes but is not limited to level switches, level transmitters, level gauges, level probes

Maintaining level equipment includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate level equipment.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of level equipment is correctly identified

4. Authorization for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove level equipment

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The level equipment is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate level equipment.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and level equipment is correctly prepared for the calibration process

4. The level equipment is calibrated within the tolerances specified by the manufactures calibration manuals
5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the level equipment.

ASSESSMENT CRITERIA

1 The level equipment is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the level equipment is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of level equipment

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of level equipment including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of level equipment and their accessories.

Hazards and preventive precautions associated with level equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty level equipment and interpreting job requirements.

TITLE: **Maintain flow equipment**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

LEVEL: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Maintain Flow equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of flow measurement

Types of flow measurement

Calculations and units of measurement used in flow measurement

Physical properties of the product being measured

UNIT STANDARD RANGE

Flow measurement principles includes but is not limited to differtial pressure, ultrasonic, conductivity, optical, thermal.

The range of flow equipment includes but is not limited to, magflow, flow indicators, variable area and flow integrator.

Maintaining flow equipment includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate flow equipment.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of flow equipment is correctly identified

4. Authorization for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove flow equipment

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The flow equipment is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate flow equipment.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and flow equipment is correctly prepared for the calibration process

4. The flow equipment is calibrated within the tolerances specified by the manufactures calibration manuals

5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the flow equipment.

ASSESSMENT CRITERIA

1 The flow equipment is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the flow equipment is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of flow equipment

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of flow equipment including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of flow equipment and their accessories.

Hazards and preventive precautions associated with flow equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty flow equipment and interpreting job requirements.

TITLE: **Read and interpret Instrumentation Drawings.**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 3

CREDITS: 4

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Select, interpret and analyze Instrumentation Drawings
Demonstrate knowledge of different types and applications of Instrumentation Drawings.

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Induction to industry
Symbols and Abbreviations

Types of Drawings

UNIT STANDARD RANGE

Instrumentation Drawings include, but are not limited to loop diagrams, process and instrumentation diagrams, flow diagrams, hook-ups and schematic diagrams.

Care of drawings include but is not limited to proper storage and ensuring drawings are relevant

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Identify and select Instrumentation drawings.

ASSESSMENT CRITERIA

1. Correctly differentiate between the different types of Measurement, Control and Instrumentation drawings

2. The correct Measurement, Control and Instrumentation drawings are chosen according to the activity required

3. The correct Measurement, Control and Instrumentation drawing is obtained using the drawing numbering system that is implemented in the workplace

SPECIFIC OUTCOME 2

Demonstrate an understanding of Instrumentation drawings.

ASSESSMENT CRITERIA

1. The symbols and abbreviations on the Measurement, Control and Instrumentation drawings are correctly identified.

2. The purpose of Measurement, Control and Instrumentation and diagrams are correctly explained.

3. The Measurement, Control and Instrumentation drawing legends are correctly used to extract appropriate information from the drawing.

SPECIFIC OUTCOME 3

Interpret and use instrumentation drawings and diagrams

ASSESSMENT CRITERIA

1. The physical equipment and control loops are correctly located as per the Measurement, Control and Instrumentation drawings

2. The physical equipment and control loops are correctly verified and correspond to the Measurement, Control and Instrumentation drawings

3. The activity is correctly completed by using the Measurement, Control and Instrumentation drawings

4. The deviations from standards are accurately recorded and reported to the relevant personnel.

SPECIFIC OUTCOME 4

Care and Storage of Instrumentation Drawings

ASSESSMENT CRITERIA

1. The drawings are kept clean and correctly handled as per workplace procedure

2. The drawings are correctly stored according to company procedures and documentation storage systems

3. Damage to drawings are accurately recorded and reported to the relevant personnel.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Document Numbering and Storage Systems for Instrumentation Drawings.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING
Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING
Work effectively with others - working under supervision.
UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting damaged or outdated Instrumentation Drawings and interpreting job requirements.

TITLE: **Select, inspect, use and maintain Measurement, Test and Calibration equipment.**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 3

CREDITS: 8

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Safely identify, select, inspect, use and maintain Measurement, Test and Calibration equipment used for the calibration of instrumentation.
Demonstrate knowledge of different types and applications of Measurement, Test and Calibration equipment.
Carry out test and calibration jobs with the aid of the applicable Measurement, Test and Calibration equipment.

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Induction to industry

Basic electrical safety

Use of hand tools

UNIT STANDARD RANGE

Statutory requirements include but are not limited to: Occupational Health and Safety Act, Local Authorities requirements and manufacturers specifications.

Measurement, Test and Calibration equipment include, but are not limited to; Temperature calibration mediums (dry block, bath etc.), Milli-volt/amp sources, Deadweight testers, Decade boxes, Temperature/Pressure calibrators/simulators, Comparators, Oscilloscopes, Function Generators, Manometers.

Caring for and maintaining of Measurement, Test and Calibration equipment includes, but is not limited to; Verification, calibration, adjustment, storage and Certification of in terms of statuary requirements.

Safety precautions include the use of personal protective equipment, electrical and fire protection.

Statutory requirements include but are not limited to ISO/IEC-17025, OSH Act, and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Select and Inspect Measurement, Test and Calibration equipment for calibration of process instrumentation.

ASSESSMENT CRITERIA

1. The Measurement, Test and Calibration equipment is correctly selected according to the job requirement.

2. The maintenance manuals/specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of Measurement, Test and Calibration equipment are recognised and the correct precautions are taken according to workplace procedures and manufacturers specifications.

4. Faulty and unsafe equipment is correctly identified and accurately documented and reported to the relevant personnel during the inspection.

SPECIFIC OUTCOME 2

Demonstrate knowledge of different types and applications of Measurement, Test and Calibration equipment.

ASSESSMENT CRITERIA

1. The different types of calibration equipment are correctly identified.

2. The various applications applicable to different types of calibration equipment and their associated procedures are correctly identified.

3. The applicable safety precautions are correctly identified for using various types of calibration equipment.

4. The correct regulatory specifications and requirements are identified when using various types calibration equipment.

SPECIFIC OUTCOME 3

Maintain Measurement, Test and Calibration equipment for calibration of process instrumentation.

ASSESSMENT CRITERIA

1. The equipment is correctly packed and stored in accordance with manufacture's specification.

2. The equipment is correctly cleaned and inspected for damage before use according to workplace procedures and manufacturers specifications

3. The equipment is correctly tested for satisfactory operation according to manufacturers specifications

4. The deviations from standards are accurately recorded and reported to the relevant personnel

SPECIFIC OUTCOME 4

Carry out test and calibration jobs with the aid of the applicable Measurement, Test and Calibration equipment.

ASSESSMENT CRITERIA

1. The equipment is correctly set-up for calibration purposes according to the workplace procedures and manufacturers specifications.

2. The equipment specifications are correctly tested against manufacturer standards during pre-calibration testing.

3. The deviations from manufacturer standards are accurately recorded.

4. The field instrumentation equipment is correctly calibrated within the tolerances provided for by the manufacturer.

5. The results are accurately recorded and reported to the relevant personnel.

6. The equipment is correctly removed after calibration according to workplace procedures.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of Measurement, Test and Calibration equipment including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of Measurement, Test and Calibration equipment and their accessories.

Hazards and preventive precautions associated with Measurement, Test and Calibration equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty Measurement, Test and Calibration equipment and interpreting job requirements.

TITLE: **Maintain Controllers**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

Level: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Maintain Controllers

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of controllers

Types of controllers

Calculations and units of measurement used in controllers

Physical properties of the product being measured

UNIT STANDARD RANGE

Final control element principles includes but is not limited to pneumatic or electronic

The range of controllers includes but is not limited to temperature, flow and pressure.

Maintaining controllers includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate controllers.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of controllers is correctly identified

4. Authorization for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove controllers

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The controllers is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate controllers.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and controllers is correctly prepared for the calibration process

4. The controllers is calibrated within the tolerances specified by the manufactures calibration manuals

5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the controllers.

ASSESSMENT CRITERIA

1 The controllers is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the controllers is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of controllers

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation

guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of controllers including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of controllers and their accessories.

Hazards and preventive precautions associated with controllers.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty controllers and interpreting job requirements.

TITLE: **Install, test and maintain a basic hydraulic system**

UNIT STANDARD NUMBER:

LEVEL ON NQF: **3**

CREDITS: **10**

FIELD: **Manufacturing, Engineering and Technology**

SUB FIELD: **Manufacturing and Assembly**

ISSUE DATE:

REVIEW DATE:

PURPOSE:

The skills, values and knowledge reflected in this unit standard are required by people in the field of mechatronics. The learning outcomes in this unit standard also contribute to the exit level outcomes required for the mechatronics NQF level 4 qualification.

Qualifying learners can install, test and maintain a basic hydraulic system.

LEARNING ASSUMED TO BE IN PLACE:

This unit standard has been designed to be as part of a progression. It is one of a series of unit standards for activities at and above this level. The credits assigned to it are based on the assumption that the learner is learning what is needed for this unit standard as part of his/her learning for a range of related unit standards at this level.

SPECIFIC OUTCOMES

1. Read and interpret basic hydraulic circuit diagrams and related component symbols

2. Identify and select hydraulic components

   Range:

   Hydraulic components include pumps, reservoirs, pressure regulators, instrumentation, piping, seals, connectors, valves, manometers, actuators, cylinders, relief valves, drivers

3. Install basic hydraulic circuits

   Range:

   Circuits are to include basic lifting circuits, basic motor circuits, basic pushing circuits

4. Test basic hydraulic circuits and record results

   Range:

   Hydraulic testing includes pressure testing and leakage testing

5. Maintain basic hydraulic circuits

6. Work safely with due care for self, fellow workers, machines, equipment, materials and the environment

ASSESSMENT CRITERIA

Results achieved

1. Basic hydraulic circuit diagrams and related symbols interpreted correctly
2. Hydraulic circuits installed to specifications
3. Lines joined and terminated
4. Hydraulic circuits are tested and results recorded
5. Installations are maintained to specifications

Indicators

1. Correct components are selected and used
2. Test equipment is used correctly
3. Safe working practices are adhered to
4. Correct tools are selected and used
5. Problems are reported timeously to appropriate personnel
6. A clean and tidy work environment is maintained

Understanding confirmed

1. Respond to 'what if' and 'why' questions covering:
   - Principles of hydraulics

- Diagrams and related symbols
- Hydraulic components
- Test equipment and procedures
- Hydraulic safety

2. Explain and discuss the implications of not adhering to the sequence of activities and operations as described in the specific outcomes and making decisions inappropriate to the task

ACCREDITATION AND MODERATION:

The assessment will be governed by the policies and guidelines of the MERSETA Education and Training Quality Assuror who has jurisdiction over this field of learning. The assessor will be accredited and have a technical qualification in this learning area.

The learner can be assessed in the language of his/her choice although s/he has to report incidents or conditions to someone else. The learner will be assessed on his/her ability to report in the language commonly used in his/her working environment.

The learner will be assessed in the workplace but s/he can submit documents, projects, test results and assignments that were not produced in the workplace.

The learner can be assessed against this unit standard to obtain credits or as part of an integrated assessment for a qualification.

RANGE STATEMENT:

The scope and level of this unit standard is determined by the ranges as indicated under the specific outcomes.

Work is done with minimal supervision.

NOTES:

Essential Embedded Knowledge

1. Names & functions of:
   - Hydraulic components
   - Hydraulic test equipment
   - Basic hydraulic circuits

2. Attributes, descriptions, characteristics & properties:
   - Properties of liquids

- Cylinders in series and parallel

3. Sensory cues:
   - Use of senses to detect faulty components
   - Use of sight to read hydraulic diagrams

4. Purpose of:
   - Reading circuit diagrams
   - Using variety of components
   - Pressure regulator
   - Flow meter
   - Maintenance and trouble shooting

5. Processes, events, causes and effects, implications:
   - Causes of damage and injury
   - Implications of incorrect testing applications
   - Implication of not applying pneumatic safety

6. Procedures and techniques:
   - Installation procedures
   - Testing procedures

7. Regulations, legislation, agreements, policies, standards:
   - Applicable safety, health and environmental protection legislation and standards

8. Theory: rules, principles, laws:
   - Principles of hydraulics
   - Pascal's pressure laws

9. Relationships, systems:
   - Relationship between testing and hydraulic safety
   - Relationship between hydraulic installations and control systems

Critical Cross-Field Education & Training Outcomes

1. Identify and solve problems
    - Recognise situations that require corrective action

2. Work effectively with others
    - Contribute to workgroup efforts to maintain cleanliness, safety and quality
    - Contribute to working in groups to determine a solution to an identified problem

3. Organise and manage myself and my activities
    - Apply correct procedures for using, storing and caring for test equipment, tools, hydraulic diagrams and components

4. Communicate effectively
    - Use common names for hydraulic components
    - Use common names for test equipment
    - Use common names for hydraulic circuits
    - Fill in the necessary fault reports and material requisition forms

5. Use science and technology effectively and critically
    - Principles of fluid pressure

6. Demonstrate an understanding of the world as a set of related systems
    - Relate the installation of hydraulic circuits to other applications

SUPPLEMENTARY INFORMATION:

TITLE: **Maintain recorders**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

LEVEL: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Maintain Recorders

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of recorders measurement

Types of recorders measurement

Calculations and units of measurement used in recorders measurement

Physical properties of the product being measured

UNIT STANDARD RANGE

Recorders measurement principles includes but is not limited to pneumatic or electronic

The range of recorders includes but is not limited temperature, flow, level and pressure

Maintaining recorders includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate recorders.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of recorders is correctly identified

4. Authorization for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove recorders

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The recorders is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate recorders.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and recorders is correctly prepared for the calibration process

4. The recorders is calibrated within the tolerances specified by the manufactures calibration manuals

5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the recorders.

ASSESSMENT CRITERIA

1 The recorders is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the recorders is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of recorders

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of recorders including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of recorders and their accessories.

Hazards and preventive precautions associated with recorders.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty recorders and interpreting job requirements.

TITLE: **Demonstrate an understanding of basic programmable logic controllers**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL 3

CREDITS 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field. A person credited with this unit standard will be able to: Demonstrate an understanding of basic programmable logic controllers (PLC)

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Induction to industry

Basic computer literacy

Basic understanding of electricity

Basic digital electronics

UNIT STANDARD RANGE

Type of PLC's used include but is not limited to block PLC's, modular PLC's, screw mounted PLC's, din rail PLC's.

The range of PLC equipment includes but is not limited to central processing unit, input modules, output modules, power supply, back plane.

Programming languages appropriate to the PLC used include but are not limited to Ladder, STL and SFC.

Safety precautions include the use of personal protective equipment, electrical and fire protection and process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the input/output peripherals of a PLC

ASSESSMENT CRITERIA

1. The correct PLC peripheral is identified. (input/output, discrete, digital, analogue, intelligent)

2. The correct manuals, specifications and drawings are selected for the PLC peripheral in use

3. The hazards associated with the use of peripherals of a PLC are correctly recognised and the necessary precautions taken according to workplace procedures

4. The correct operation of the PLC peripneral device must be demonstrated

5. The PLC peripherals are correctly removed and replaced according to manufactures specifications.

SPECIFIC OUTCOME 2

Demonstrate an understanding of field devices interfaced to programmable logic controllers.

ASSESSMENT CRITERIA

1. The correct field device is identified (pushbuttons, limits, level, pressure devices)

2. The operation of the field device is verified according to the manufactures specification and workplace procedures

3. The field device is correctly connected to the appropriate peripheral as per manufacturers specifications.

4. Appropriate personal safety equipment is correctly selected according to the job requirement and company SHERQ policies.

SPECIFIC OUTCOME 3

Demonstrate an understanding of the processor in a programmable logic controller.

ASSESSMENT CRITERIA

1. The functions of the PLC indicator lights of the processor are correctly explained as per manufacturers operating procedures

2. The PLC battery of the processor is correctly identified, removed & replaced according to manufactures specifications.

3. The faults are correctly diagnosed by utilising the PLC indicator lights as per manufacturers operating procedures

4. The PLC processor mode switch is correctly identified and utilized according to the task instruction and manufacturers operating procedures

5. The PLC communication status indicators are correctly identified and the status correctly explained as per manufacturers operating procedures

SPECIFIC OUTCOME 4

Demonstrate an understanding of the back plane and power supply of a programmable logic controller.

ASSESSMENT CRITERIA

1. The placement of the PLC peripherals and processor on the back plane are correct according to the address structure of the back plane as per manufacturers operating procedures

2. The correct PLC addressing modes are selected on the back plane for the PLC peripheral modules selected.

3. The correct insertion of the PLC power supply is carried out according to manufactures specifications.

4. The correct connections for the PLC redundant power supply have been made as per manufacturers operating procedures

SPECIFIC OUTCOME 5

Demonstrate an understanding of the programming terminal

ASSESSMENT CRITERIA

1. The PLC handheld or programming terminal must be correctly connected to the processor as per manufacturers operating procedures

2. Establish the correct communication between the programmer and the processor as per manufacturers operating procedures

3. The correct sequence is used to monitor the PLC on-line programme that resides in the processor as per manufacturers operating procedures

4. The instruction mnemonics are correctly explained with reference to the field devices as per manufacturers programming manual

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of programmable logic controllers , including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of pressure equipment and their accessories.

Hazards and preventive precautions associated with pressure equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty pressure equipment and interpreting job requirements.

TITLE: Demonstrate an understanding of and install Instrument impulse lines.

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 2

CREDITS: 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Safely identify, select, inspect, install and maintain Instrument impulse lines.
Demonstrate knowledge of different types and applications of Instrument impulse lines
Test for leaks and blockages

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Use of hand tools

UNIT STANDARD RANGE

Statutory requirements include but are not limited to: Occupational Health and Safety Act, Local Authorities requirements and manufacturers specifications.

Instrument impulse lines including all associated fittings.

Safety precautions include the use of all appropriate personal protective equipment, electrical and fire protection.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Select and Inspect Instrument impulse lines

ASSESSMENT CRITERIA

1. The Instrument impulse lines are correctly selected according to the job requirement.

2. The maintenance manuals, specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of instrument impulse lines are recognised and necessary precautions taken according to work site procedures.

4. The damaged and unsafe instrument impulse lines are identified and accurately reported to the relevant personnel.

SPECIFIC OUTCOME 2

Demonstrate knowledge of different types and applications of Instrument impulse lines

ASSESSMENT CRITERIA

1. Accurately identify various types of Instrument impulse lines.

2. Identify various applications for different types of Instrument impulse lines and their associated procedures.

3. Identify applicable safety precautions than need to be taken when using various types of Instrument impulse lines.

SPECIFIC OUTCOME 3

Maintain Instrument impulse lines.

ASSESSMENT CRITERIA

1. Check that instrument impulse lines are correctly installed in accordance with manufacturer specifications and applicable safety requirements.

2. Clean, inspect and replace damaged instrument impulse lines.

3. Test for and repair instrument impulse lines for leaks.

4. Deviations from standards are recorded and reported to the relevant personnel.

SPECIFIC OUTCOME 4

Install and Commission Instrument impulse lines

ASSESSMENT CRITERIA

1. Correctly set-up instrument impulse lines for installation according to workplace and manufacturer specifications.

2. Install and test instrument impulse lines according to prescribed standards.

3. Record deviations from prescribed standards and take corrective action.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of Instrument impulse lines including the use of personal protective equipment, electrical and fire protection.

Locations of Instrument impulse lines and their accessories.

Hazards and preventive precautions associated with Instrument impulse lines

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - damaged equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting damaged Instrument impulse lines and interpreting job requirements.

TITLE: **Demonstrate an understanding of and maintain Equipment associated with final control elements**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

Level: 2

CREDITS: 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Demonstrate an understanding of and maintain Equipment associated with final control elements

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Basic electrical safety

Use of hand tools

UNIT STANDARD RANGE

Final control elements includes but is not limited to Pneumatic, Electric and hydraulic actuated vales, Power cylinders, Pneumatic to current converters.

The range of final control elements includes any device that changes the value of the measured variable including the associated control elements.

Caring for equipment associated with final control elements includes but is not limited to removing, replacing, adjustment or setting up, cleaning, lubricating and tightening.

Safety precautions include the use of all personal protective equipment, electrical and fire protection and process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the planning for maintaining equipment associated with final control elements.

ASSESSMENT CRITERIA

1. The tools are correctly selected according to the job requirement.

2. The repair manuals, specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of equipment associated with final control elements are recognised and necessary precautions taken according to workplace and manufacturers procedures.

SPECIFIC OUTCOME 2

Demonstrate an understanding of safe working conditions when working with equipment associated with final control elements.

ASSESSMENT CRITERIA

1. The personal safety equipment is correctly selected and worn according to the job requirement.

2. The pre-operational checks are carried out according to the prescribed safety requirements.

3. The faulty and unsafe equipment is identified and reported to the relevant personnel.

SPECIFIC OUTCOME 3

Demonstrate an understanding of how to remove equipment associated with final control elements.

ASSESSMENT CRITERIA

1. The tools are correctly selected and set up according to job requirements.

2. The personal protective equipment applicable to the job is worn.

3. The tools are used correctly and safely in accordance with the job requirements and manufacturers specifications.

4. Correctly identify and isolate the process associated with Measurement, Control and Instrumentation and electrical equipment.

5. The equipment associated with final control elements is removed and cleaned according to workplace practices and/or manufacturer specifications.

SPECIFIC OUTCOME 4

Demonstrate an understanding of how to install equipment associated with final control elements.

ASSESSMENT CRITERIA

1. The equipment associated with final control elements is correctly installed according to workplace and manufacturers specifications.

2. The equipment associated with final control elements is inspected for incurred defects in accordance to workplace and manufacturers specifications.

3. Reinstate the process associated with Measurement, Control and Instrumentation and the electrical equipment.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of Equipment associated with final control elements and their accessories.

Hazards and preventive precautions associated with Equipment associated with final control elements.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty Equipment associated with final control elements and interpreting job requirements.

TITLE: **Select, inspect, use and maintain Measurement, Test and Calibration equipment.**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 3

CREDITS: 8

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Safely identify, select, inspect, use and maintain Measurement, Test and Calibration equipment used for the calibration of instrumentation.
Demonstrate knowledge of different types and applications of Measurement, Test and Calibration equipment.
Carry out test and calibration jobs with the aid of the applicable Measurement, Test and Calibration equipment.

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Induction to industry

Basic electrical safety

Use of hand tools

UNIT STANDARD RANGE

Statutory requirements include but are not limited to: Occupational Health and Safety Act, Local Authorities requirements and manufacturers specifications.

Measurement, Test and Calibration equipment include, but are not limited to; Temperature calibration mediums (dry block, bath etc.), Milli-volt/amp sources, Deadweight testers, Decade boxes, Temperature/Pressure calibrators/simulators, Comparators, Oscilloscopes, Function Generators, Manometers.

Caring for and maintaining of Measurement, Test and Calibration equipment includes, but is not limited to; Verification, calibration, adjustment, storage and Certification of in terms of statuary requirements.

Safety precautions include the use of personal protective equipment, electrical and fire protection.

Statutory requirements include but are not limited to ISO/IEC-17025, OSH Act, and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Select and Inspect Measurement, Test and Calibration equipment for calibration of process instrumentation.

ASSESSMENT CRITERIA

1. The Measurement, Test and Calibration equipment is correctly selected according to the job requirement.

2. The maintenance manuals/specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of Measurement, Test and Calibration equipment are recognised and the correct precautions are taken according to workplace procedures and manufacturers specifications.

4. Faulty and unsafe equipment is correctly identified and accurately documented and reported to the relevant personnel during the inspection.

SPECIFIC OUTCOME 2

Demonstrate knowledge of different types and applications of Measurement, Test and Calibration equipment.

ASSESSMENT CRITERIA

1. The different types of calibration equipment are correctly identified.

2. The various applications applicable to different types of calibration equipment and their associated procedures are correctly identified.

3. The applicable safety precautions are correctly identified for using various types of calibration equipment.

4. The correct regulatory specifications and requirements are identified when using various types calibration equipment.

SPECIFIC OUTCOME 3

Maintain Measurement, Test and Calibration equipment for calibration of process instrumentation.

ASSESSMENT CRITERIA

1. The equipment is correctly packed and stored in accordance with manufacture's specification.

2. The equipment is correctly cleaned and inspected for damage before use according to workplace procedures and manufacturers specifications

3. The equipment is correctly tested for satisfactory operation according to manufacturers specifications

4. The deviations from standards are accurately recorded and reported to the relevant personnel

SPECIFIC OUTCOME 4

Carry out test and calibration jobs with the aid of the applicable Measurement, Test and Calibration equipment.

ASSESSMENT CRITERIA

1. The equipment is correctly set-up for calibration purposes according to the workplace procedures and manufacturers specifications.

2. The equipment specifications are correctly tested against manufacturer standards during pre-calibration testing.

3. The deviations from manufacturer standards are accurately recorded.

4. The field instrumentation equipment is correctly calibrated within the tolerances provided for by the manufacturer.

5. The results are accurately recorded and reported to the relevant personnel.

6. The equipment is correctly removed after calibration according to workplace procedures.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of Measurement, Test and Calibration equipment including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of Measurement, Test and Calibration equipment and their accessories.

Hazards and preventive precautions associated with Measurement, Test and Calibration equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty Measurement, Test and Calibration equipment and interpreting job requirements.

TITLE: **Install, test and maintain a basic hydraulic system**

UNIT STANDARD NUMBER:

LEVEL ON NQF: 3

CREDITS: 10

FIELD: **Manufacturing, Engineering and Technology**

SUB FIELD: **Manufacturing and Assembly**

ISSUE DATE:

REVIEW DATE:

PURPOSE:

The skills, values and knowledge reflected in this unit standard are required by people in the field of mechatronics. The learning outcomes in this unit standard also contribute to the exit level outcomes required for the mechatronics NQF level 4 qualification.

Qualifying learners can install, test and maintain a basic hydraulic system.

LEARNING ASSUMED TO BE IN PLACE:

This unit standard has been designed to be as part of a progression. It is one of a series of unit standards for activities at and above this level. The credits assigned to it are based on the assumption that the learner is learning what is needed for this unit standard as part of his/her learning for a range of related unit standards at this level.

SPECIFIC OUTCOMES

1. Read and interpret basic hydraulic circuit diagrams and related component symbols

2. Identify and select hydraulic components

   Range:

   Hydraulic components include pumps, reservoirs, pressure regulators, instrumentation, piping, seals, connectors, valves, manometers, actuators, cylinders, relief valves, drivers

3. Install basic hydraulic circuits

   Range:

   Circuits are to include basic lifting circuits, basic motor circuits, basic pushing circuits

4. Test basic hydraulic circuits and record results

   Range:

   Hydraulic testing includes pressure testing and leakage testing

5. Maintain basic hydraulic circuits

6. Work safely with due care for self, fellow workers, machines, equipment, materials and the environment

ASSESSMENT CRITERIA

Results achieved

1. Basic hydraulic circuit diagrams and related symbols interpreted correctly
2. Hydraulic circuits installed to specifications
3. Lines joined and terminated
4. Hydraulic circuits are tested and results recorded
5. Installations are maintained to specifications

Indicators

1. Correct components are selected and used
2. Test equipment is used correctly
3. Safe working practices are adhered to
4. Correct tools are selected and used
5. Problems are reported timeously to appropriate personnel
6. A clean and tidy work environment is maintained

Understanding confirmed

1. Respond to 'what if' and 'why' questions covering:
   - Principles of hydraulics

- Diagrams and related symbols
- Hydraulic components
- Test equipment and procedures
- Hydraulic safety

2. Explain and discuss the implications of not adhering to the sequence of activities and operations as described in the specific outcomes and making decisions inappropriate to the task

ACCREDITATION AND MODERATION:

The assessment will be governed by the policies and guidelines of the MERSETA Education and Training Quality Assuror who has jurisdiction over this field of learning. The assessor will be accredited and have a technical qualification in this learning area.

The learner can be assessed in the language of his/her choice although s/he has to report incidents or conditions to someone else. The learner will be assessed on his/her ability to report in the language commonly used in his/her working environment.

The learner will be assessed in the workplace but s/he can submit documents, projects, test results and assignments that were not produced in the workplace.

The learner can be assessed against this unit standard to obtain credits or as part of an integrated assessment for a qualification.

RANGE STATEMENT:

The scope and level of this unit standard is determined by the ranges as indicated under the specific outcomes.

Work is done with minimal supervision.

NOTES:

Essential Embedded Knowledge

1. Names & functions of:
    - Hydraulic components
    - Hydraulic test equipment
    - Basic hydraulic circuits

2. Attributes, descriptions, characteristics & properties:
    - Properties of liquids

- Cylinders in series and parallel

3. Sensory cues:
    - Use of senses to detect faulty components
    - Use of sight to read hydraulic diagrams

4. Purpose of:
    - Reading circuit diagrams
    - Using variety of components
    - Pressure regulator
    - Flow meter
    - Maintenance and trouble shooting

5. Processes, events, causes and effects, implications:
    - Causes of damage and injury
    - Implications of incorrect testing applications
    - Implication of not applying pneumatic safety

6. Procedures and techniques:
    - Installation procedures
    - Testing procedures

7. Regulations, legislation, agreements, policies, standards:
    - Applicable safety, health and environmental protection legislation and standards

8. Theory: rules, principles, laws:
    - Principles of hydraulics
    - Pascal's pressure laws

9. Relationships, systems:
    - Relationship between testing and hydraulic safety
    - Relationship between hydraulic installations and control systems

Critical Cross-Field Education & Training Outcomes

1. Identify and solve problems
    - Recognise situations that require corrective action

2. Work effectively with others
    - Contribute to workgroup efforts to maintain cleanliness, safety and quality
    - Contribute to working in groups to determine a solution to an identified problem

3. Organise and manage myself and my activities
    - Apply correct procedures for using, storing and caring for test equipment, tools, hydraulic diagrams and components

4. Communicate effectively
    - Use common names for hydraulic components
    - Use common names for test equipment
    - Use common names for hydraulic circuits
    - Fill in the necessary fault reports and material requisition forms

5. Use science and technology effectively and critically
    - Principles of fluid pressure

6. Demonstrate an understanding of the world as a set of related systems
    - Relate the installation of hydraulic circuits to other applications

TITLE: **Demonstrate an understanding of basic programmable logic controllers**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 3

CREDITS: 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Demonstrate an understanding of basic programmable logic controllers (PLC)

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Induction to industry

Basic computer literacy

Basic understanding of electricity

Basic digital electronics

UNIT STANDARD RANGE

Type of PLC's used include but is not limited to block PLC's, modular PLC's, screw mounted PLC's, din rail PLC's.

The range of PLC equipment includes but is not limited to central processing unit, input modules, output modules, power supply, back plane.

Programming languages appropriate to the PLC used include but are not limited to Ladder, STL and SFC.

Safety precautions include the use of personal protective equipment, electrical and fire protection and process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the input/output peripherals of a PLC

ASSESSMENT CRITERIA

1. The correct PLC peripheral is identified. (input/output, discrete, digital, analogue, intelligent)

2. The correct manuals, specifications and drawings are selected for the PLC peripheral in use

3. The hazards associated with the use of peripherals of a PLC are correctly recognised and the necessary precautions taken according to workplace procedures

4. The correct operation of the PLC peripheral device must be demonstrated

5. The PLC peripherals are correctly removed and replaced according to manufactures specifications.

SPECIFIC OUTCOME 2

Demonstrate an understanding of field devices interfaced to programmable logic controllers.

ASSESSMENT CRITERIA

1. The correct field device is identified (pushbuttons, limits, level, pressure devices)

2. The operation of the field device is verified according to the manufactures specification and workplace procedures

3. The field device is correctly connected to the appropriate peripheral as per manufacturers specifications.

4. Appropriate personal safety equipment is correctly selected according to the job requirement and company SHERQ policies.

SPECIFIC OUTCOME 3

Demonstrate an understanding of the processor in a programmable logic controller.

ASSESSMENT CRITERIA

1. The functions of the PLC indicator lights of the processor are correctly explained as per manufacturers operating procedures

2. The PLC battery of the processor is correctly identified, removed & replaced according to manufactures specifications.

3. The faults are correctly diagnosed by utilising the PLC indicator lights as per manufacturers operating procedures

4. The PLC processor mode switch is correctly identified and utilized according to the task instruction and manufacturers operating procedures

5. The PLC communication status indicators are correctly identified and the status correctly explained as per manufacturers operating procedures

SPECIFIC OUTCOME 4

Demonstrate an understanding of the back plane and power supply of a programmable logic controller.

ASSESSMENT CRITERIA

1. The placement of the PLC peripherals and processor on the back plane are correct according to the address structure of the back plane as per manufacturers operating procedures

2. The correct PLC addressing modes are selected on the back plane for the PLC peripheral modules selected.

3. The correct insertion of the PLC power supply is carried out according to manufactures specifications.

4. The correct connections for the PLC redundant power supply have been made as per manufacturers operating procedures

SPECIFIC OUTCOME 5

Demonstrate an understanding of the programming terminal

ASSESSMENT CRITERIA

1. The PLC handheld or programming terminal must be correctly connected to the processor as per manufacturers operating procedures

2. Establish the correct communication between the programmer and the processor as per manufacturers operating procedures

3. The correct sequence is used to monitor the PLC on-line programme that resides in the processor as per manufacturers operating procedures

4. The instruction mnemonics are correctly explained with reference to the field devices as per manufacturers programming manual

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of programmable logic controllers including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of pressure equipment and their accessories.

Hazards and preventive precautions associated with pressure equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty pressure equipment and interpreting job requirements.

TITLE: **Maintain Equipment associated with final control elements**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF Level: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Maintain equipment associated with final control elements

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of equipment associated with final control elements

Types of equipment associated with final control elements

Calculations and units of measurement used in equipment associated with final control elements

Physical properties of the product being measured

UNIT STANDARD RANGE

Final control element principles includes but is not limited to Pneumatic, Electric and Hydraulic actuated valves, Power cylinders, Pneumatic or Current converters

The range of equipment associated with final control elements includes any device that changes the value of the measured variable including the associated control elements.

Maintaining equipment associated with final control elements includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate equipment associated with final control elements.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of equipment associated with final control elements is correctly identified

4. Authorization for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove equipment associated with final control elements

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The equipment associated with final control elements is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate equipment associated with final control elements.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and equipment associated with final control elements is correctly prepared for the calibration process

4. The equipment associated with final control elements is calibrated within the tolerances specified by the manufactures calibration manuals

5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the equipment associated with final control elements.

ASSESSMENT CRITERIA

1 The equipment associated with final control elements is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the equipment associated with final control elements is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of equipment associated with final control elements

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of equipment associated with final control elements including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of equipment associated with final control elements and their accessories.

Hazards and preventive precautions associated with equipment associated with final control elements.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty equipment associated with final control elements and interpreting job requirements.

TITLE: **Maintain analytical equipment**

FIELD : Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

LEVEL: 3

CREDITS: 7

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Maintain Analytical equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Principles of analytical measurement

Types of analytical measurement

Calculations and units of measurement used in analytical measurement

Physical properties of the product being measured

UNIT STANDARD RANGE

Analytical measurement principles includes but is not limited to nuclear, electrical conductivity, optic and consistency.

The range of analytical equipment includes but is not limited to conductivity meters, pH meters, densitometers, lead analysers and turbidity meters.

Maintaining analytical equipment includes isolation, removal, calibration, installation and commissioning.

Safety precautions include the use of all personal protective equipment, electrical and fire protection

Statutory requirements include but are not limited to SANS and OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Plan and prepare to isolate and de-isolate analytical equipment.

ASSESSMENT CRITERIA

1. Job requirements are correctly interpreted according to instructions and/or instrumentation diagrams

2. Tools and equipment are correctly selected according to job requirement

3. The location for the isolation of analytical equipment is correctly identified

4. Authorization for access to restricted areas is obtained from the relevant personnel

5. The correct safety equipment and material required is obtained from the appropriate sources

6. The working schedule is effectively communicated to all affected parties

SPECIFIC OUTCOME 2

Isolate and remove analytical equipment

ASSESSMENT CRITERIA

1. The area where isolation is to be carried out is correctly prepared for the isolation procedure

2. The correct tools are selected and used according to the job requirements

3. The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly identified and isolated according to the isolation procedure

4. All safety precautions are adhered to before, during and after the isolation and removal procedure

5. The analytical equipment is correctly removed in accordance with manufacturers procedures

SPECIFIC OUTCOME 3

Calibrate analytical equipment.

ASSESSMENT CRITERIA

1.The correct calibration, test equipment and relevant manuals/data sheets are selected for the calibration procedure

2. The correct tools are selected and used according to the job requirements

3. The calibration, test and analytical equipment is correctly prepared for the calibration process

4. The analytical equipment is calibrated within the tolerances specified by the manufactures calibration manuals

5. The calibration sheets and associated documentation is accurately completed

SPECIFIC OUTCOME 4

Install, de-isolate and commission the analytical equipment.

ASSESSMENT CRITERIA

1 The analytical equipment is installed in the correct location as per Measurement, Control and Instrumentation drawing

2 The process associated with Measurement, Control and Instrumentation and electrical equipment is correctly de-isolated according to the de-isolation procedures

3. All safety precautions are adhered to before, during and after the installation, de-isolation and commissioning process

4. The correct operation of the analytical equipment is verified according to the workplace operating instructions and Measurement, Control and Instrumentation drawing

SPECIFIC OUTCOME 5

Establish normal conditions after maintenance of analytical equipment

ASSESSMENT CRITERIA

1 The waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

2 All tools and equipment are checked, cleaned and correctly stored as per workplace and manufacturers procedures

3 The workplace is restored to original state as per housekeeping standards and work site procedures

4 All documentation is accurately completed and filed or submitted to the relevant personnel

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of analytical equipment including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of analytical equipment and their accessories.

Hazards and preventive precautions associated with analytical equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty analytical equipment and interpreting job requirements.

TITLE: **Demonstrate an understanding of basic programmable logic controllers**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL 3

CREDITS 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field. A person credited with this unit standard will be able to: Demonstrate an understanding of basic programmable logic controllers (PLC)

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Induction to industry

Basic computer literacy

Basic understanding of electricity

Basic digital electronics

UNIT STANDARD RANGE

Type of PLC's used include but is not limited to block PLC's, modular PLC's, screw mounted PLC's, din rail PLC's.

The range of PLC equipment includes but is not limited to central processing unit, input modules, output modules, power supply, back plane.

Programming languages appropriate to the PLC used include but are not limited to Ladder, STL and SFC.

Safety precautions include the use of personal protective equipment, electrical and fire protection and process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the input/output peripherals of a PLC

ASSESSMENT CRITERIA

1. The correct PLC peripheral is identified. (input/output, discrete, digital, analogue, intelligent)

2. The correct manuals, specifications and drawings are selected for the PLC peripheral in use

3. The hazards associated with the use of peripherals of a PLC are correctly recognised and the necessary precautions taken according to workplace procedures

4. The correct operation of the PLC peripheral device must be demonstrated

5. The PLC peripherals are correctly removed and replaced according to manufactures specifications.

SPECIFIC OUTCOME 2

Demonstrate an understanding of field devices interfaced to programmable logic controllers.

ASSESSMENT CRITERIA

1. The correct field device is identified (pushbuttons, limits, level, pressure devices)

2. The operation of the field device is verified according to the manufactures specification and workplace procedures

3. The field device is correctly connected to the appropriate peripheral as per manufacturers specifications.

4. Appropriate personal safety equipment is correctly selected according to the job requirement and company SHERQ policies.

SPECIFIC OUTCOME 3

Demonstrate an understanding of the processor in a programmable logic controller.

ASSESSMENT CRITERIA

1. The functions of the PLC indicator lights of the processor are correctly explained as per manufacturers operating procedures

2. The PLC battery of the processor is correctly identified, removed & replaced according to manufactures specifications.

3. The faults are correctly diagnosed by utilising the PLC indicator lights as per manufacturers operating procedures

4. The PLC processor mode switch is correctly identified and utilized according to the task instruction and manufacturers operating procedures

5. The PLC communication status indicators are correctly identified and the status correctly explained as per manufacturers operating procedures

SPECIFIC OUTCOME 4

Demonstrate an understanding of the back plane and power supply of a programmable logic controller.

ASSESSMENT CRITERIA

1. The placement of the PLC peripherals and processor on the back plane are correct according to the address structure of the back plane as per manufacturers operating procedures

2. The correct PLC addressing modes are selected on the back plane for the PLC peripheral modules selected.

3. The correct insertion of the PLC power supply is carried out according to manufactures specifications.

4. The correct connections for the PLC redundant power supply have been made as per manufacturers operating procedures

SPECIFIC OUTCOME 5

Demonstrate an understanding of the programming terminal

ASSESSMENT CRITERIA

1. The PLC handheld or programming terminal must be correctly connected to the processor as per manufacturers operating procedures

2. Establish the correct communication between the programmer and the processor as per manufacturers operating procedures

3. The correct sequence is used to monitor the PLC on-line programme that resides in the processor as per manufacturers operating procedures

4. The instruction mnemonics are correctly explained with reference to the field devices as per manufacturers programming manual

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of programmable logic controllers including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of pressure equipment and their accessories.

Hazards and preventive precautions associated with pressure equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty pressure equipment and interpreting job requirements.

TITLE: **Select, inspect, use and maintain Measurement, Test and Calibration equipment.**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 3

CREDITS: 8

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Safely identify, select, inspect, use and maintain Measurement, Test and Calibration equipment used for the calibration of instrumentation.
Demonstrate knowledge of different types and applications of Measurement, Test and Calibration equipment.
Carry out test and calibration jobs with the aid of the applicable Measurement, Test and Calibration equipment.

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Induction to industry

Basic electrical safety

Use of hand tools

UNIT STANDARD RANGE

Statutory requirements include but are not limited to: Occupational Health and Safety Act, Local Authorities requirements and manufacturers specifications.

Measurement, Test and Calibration equipment include, but are not limited to; Temperature calibration mediums (dry block, bath etc.), Milli-volt/amp sources, Deadweight testers, Decade boxes, Temperature/Pressure calibrators/simulators, Comparators, Oscilloscopes, Function Generators, Manometers.

Caring for and maintaining of Measurement, Test and Calibration equipment includes, but is not limited to; Verification, calibration, adjustment, storage and Certification of in terms of statuary requirements.

Safety precautions include the use of personal protective equipment, electrical and fire protection.

Statutory requirements include but are not limited to ISO/IEC-17025, OSH Act, and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Select and Inspect Measurement, Test and Calibration equipment for calibration of process instrumentation.

ASSESSMENT CRITERIA

1. The Measurement, Test and Calibration equipment is correctly selected according to the job requirement.

2. The maintenance manuals/specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of Measurement, Test and Calibration equipment are recognised and the correct precautions are taken according to workplace procedures and manufacturers specifications.

4. Faulty and unsafe equipment is correctly identified and accurately documented and reported to the relevant personnel during the inspection.

SPECIFIC OUTCOME 2

Demonstrate knowledge of different types and applications of Measurement, Test and Calibration equipment.

ASSESSMENT CRITERIA

1. The different types of calibration equipment are correctly identified.

2. The various applications applicable to different types of calibration equipment and their associated procedures are correctly identified.

3. The applicable safety precautions are correctly identified for using various types of calibration equipment.

4. The correct regulatory specifications and requirements are identified when using various types calibration equipment.

SPECIFIC OUTCOME 3

Maintain Measurement, Test and Calibration equipment for calibration of process instrumentation.

ASSESSMENT CRITERIA

1. The equipment is correctly packed and stored in accordance with manufacture's specification.

2. The equipment is correctly cleaned and inspected for damage before use according to workplace procedures and manufacturers specifications

3. The equipment is correctly tested for satisfactory operation according to manufacturers specifications

4. The deviations from standards are accurately recorded and reported to the relevant personnel

SPECIFIC OUTCOME 4

Carry out test and calibration jobs with the aid of the applicable Measurement, Test and Calibration equipment.

ASSESSMENT CRITERIA

1. The equipment is correctly set-up for calibration purposes according to the workplace procedures and manufacturers specifications.

2. The equipment specifications are correctly tested against manufacturer standards during pre-calibration testing.

3. The deviations from manufacturer standards are accurately recorded.

4. The field instrumentation equipment is correctly calibrated within the tolerances provided for by the manufacturer.

5. The results are accurately recorded and reported to the relevant personnel.

6. The equipment is correctly removed after calibration according to workplace procedures.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of Measurement, Test and Calibration equipment including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of Measurement, Test and Calibration equipment and their accessories.

Hazards and preventive precautions associated with Measurement, Test and Calibration equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty Measurement, Test and Calibration equipment and interpreting job requirements.

TITLE: Demonstrate Fault finding techniques on Field Instrumentation.

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

LEVEL: 3

CREDITS: 8

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Explain the principles and procedures (techniques) to be applied during fault finding on Field Instrumentation
Plan and prepare for fault finding on Field Instrumentation.
Find faults on Field Instrumentation.
Complete fault finding on Field Instrumentation.

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements
Knowledge of equipment (Range Statement)
Interpret Instrumentation and Process drawings and sketches
Fault finding on field Instrumentation.
Induction to industry
Basic electrical safety
Use and care of relevant testing, measuring equipment and hand tools

UNIT STANDARD RANGE

Statutory requirements include but are not limited to; SANS, Occupational Health and Safety Act, Local Authorities requirements and manufacturers specifications.

This unit standard applies to persons performing faultfinding on Field Instrumentation related to but not limited to; pressure, temperature, level, flow and final control elements.

Work site procedures may include but are not limited to:
(a) Safety procedures as given in Safety manuals
(b) Policy procedures as given in Policy manuals
(c) Installing procedures as given in Manufacturers' and Company maintenance manuals
(d) Maintaining procedure given in Manufacturers' and Company maintenance manuals

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Explain the principles and procedures (techniques) to be applied during fault finding on Field Instrumentation

ASSESSMENT CRITERIA

1. The safety regulations are correctly explained as set out in the companies safety policies and OSH act

2. The symptoms and analysis of faults on Field Instrumentation are correctly explained

3. The correct fault finding procedures which should be followed for the specific field instrumentation is explained.

4. The techniques applicable to Field Instrumentation are explained.

SPECIFIC OUTCOME 2

Plan and prepare for fault finding on Field Instrumentation

ASSESSMENT CRITERIA

1. The appropriate documentation is acquired according to job instructions

2. The job instructions are effectively communicated with the team leader according to workplace procedures

3. The appropriate personal protective equipment is selected and examined in a manner that protects the individual

4. The appropriate tools, material and equipment for the job are selected and transported to the workplace

5. The work site is examined for hazardous and sub-standard conditions. Critical hazards and sub-standard conditions encountered in a particular context are addressed

6. The work site area is verified according to workplace procedures

7. The consequences of not preparing to find faults in line with specified requirements are explained with reference to personal and team safety, impact on environment, production costs and lost time

SPECIFIC OUTCOME 3

Find faults on Field Instrumentation

ASSESSMENT CRITERIA

1. The correct system operation is determined according to workplace procedures

2. The system operation is observed according to workplace procedures

3. The system operation is analysed according to workplace procedures

4. The fault is correctly diagnosed according to work site procedures

5. The fault is traced by applying the correct techniques and procedures

6. The fault is correctly identified according to the analysis carried out

7. The appropriate safety, good housekeeping and correct environmental practices are followed before, during and after the fault finding activity

8. The correct system operation is determined according to work site procedures

SPECIFIC OUTCOME 4

Complete fault finding on Field Instrumentation

ASSESSMENT CRITERIA

1. The appropriate documentation is completed, filed or submitted to the relevant personnel

2. The correct measuring, test equipment and hand tools are selected and used according to safety policies and manufacturers specifications.

3. The appropriate tests are carried out according to workplace procedures and statutory requirements

4. The tests are accurately recorded and reported to the relevant personnel according to workplace procedures

5. The appropriate repairing, rectifying and faultfinding procedures are carried out according to company quality standards and manufacturers specifications

6. The final testing and commissioning is correctly carried out and all relevant documentation completed and filed or submitted to the relevant personnel

ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the

moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the Field Instrumentation including the use of personal protective equipment, electrical and fire protection.

A basic understanding of:

(a) The effects of fault finding on production
(b) Applicable manufactures specifications
(c) Documentation required for activity
(d) Characteristics and procedures of equipment

A comprehensive understanding of:
(a) Applicable work site procedures
(b) Reporting systems
(c) Identification, location and function of appropriate tools, measuring instruments, materials, personal protective equipment.
(d) Names and functions of equipment
(e) Fault finding principles and procedures (techniques)
(f) Interpret and draw schematic diagrams
(g) Potential faults on equipment
(h) Characteristics and properties of system operations
(i) Working principles associated with fault finding on Field Instrumentation are theoretically and practically explained

Names, locations and functions of Field Instrumentation and their accessories.

Hazards and preventive precautions associated with Field Instrumentation.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

The following critical outcomes are addressed in this unit standard:

1. Collect, evaluate, organise and critically evaluate information related to Field Instrumentation so that these are accurately interpreted into application performance standards

2. Understand the world as a set of related systems in that fault finding are interrelated with the overall safe and lawful operation in the instrumentation field
3. Organise oneself and one's activities so that all requirements are met in achieving competence in fault finding on Field Instrumentation
4. Identify and solve problems related to the achievement of relevant fault finding competencies.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty Field Instrumentation and interpreting job requirements.

National Certificate in Measurement, Control and Instrumentation: Level 2

Field: **Manufacturing, Engineering and Technology**

Sub-field: **Engineering and Related Design**

Level: **2**

Credits: **137**

Issue date

Review date

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 an entry level for learners who wish to follow this career path and forms the basis for further development.

Purpose

Qualifying learners will gain competencies that will promote professionalism in this sub field by being able to:

Identify, set up and use the appropriate instrumentation equipment
Read ,record analyse and report readings/measurements
Identify , use and maintain instruments.

Access to the qualification

This qualification series recognizes skills knowledge and values relevant to a workplace. It is designed for learners who:

- have acquired the skills and knowledge without attending formal courses or training.
- are part of a learnership / skills programme which integrates structured learning and work experience.
- have attended courses or training sessions and then apply the knowledge and skills gained to activities in the workplace initiatives.
- have full physical mobility as the Measurement, Control and Instrumentation environment is physically demanding.
- do not suffer from colour blindness which will require testing for, in order to safeguard industry and the learner.

Learning assumed to be in place

- This qualification assumes that the candidate has a General Education and Training Certificate, if candidates do not have such a qualification, learning in preparation for this qualification will also include;
- Language and mathematical literacy and numeracy.
- Science and technology.
- Teamwork.
- Dexterity and technical aptitude.

Qualifying candidates will have the ability to:

- Articulate to the level 3 qualification.
- Perform basic maintenance tasks.

Preamble

Measurement, Control and Instrumentation equipment will refer to flow, temperature, level and pressure field instrumentation. In order to demonstrate an understanding, the learner is given an application, which, if successfully carried out will demonstrate the knowledge component. This application must include the safe handling of the above-mentioned equipment.

Exit Level Outcomes and Assessment Criteria
Exit Level Outcome 1

The ability to select, use and care for engineering hand and power tools.

Associated Assessment Criteria

- Identify and select the correct tools used for measuring, loosening and fastening of bolts/nuts/screws/couplings, cutting of materials and wires as per manufacturers description.
- Identify and select the full range of Measurement, Control and Instrumentation engineering hand and power tools.
- Inspect tools for chips, ridges, sharpness and hand grips to ensure that they are serviceable.
- Maintain Measurement, Control and Instrumentation tools are maintained as per manufacturer specifications.

Exit Level Outcome 2

The ability to maintain field instruments and equipment.

Associated Assessment Criteria

- Demonstrate an understanding of the planning for maintaining field instruments and equipment
- Demonstrate an understanding of safe working conditions when working with field instruments and equipment.
- Demonstrate an understanding of how to remove field instruments and equipment.
- Demonstrate an understanding of how to install field instruments and equipment.

Exit Level Outcome 3

The ability to identify and explain the purpose of field instrumentation and equipment, in a Measurement, Control and Instrumentation process, with the aid of Instrumentation drawings.

Associated Assessment Criteria

- Demonstrate an understanding of basic Measurement, Control and Instrumentation drawings, sketches and material lists.
- Interpret basic Measurement, Control and Instrumentation symbols, drawings and sketches.
- Identify field instruments and equipment in a process as per Measurement, Control and Instrumentation drawing.
- Explain the purpose of field instruments and equipment in a control loop within the Measurement, Control and Instrumentation process.

Exit Level Outcome 4

The ability to work effectively with others as a member of team

Associated Assessment Criteria

- Demonstrate the ability to communicate with peers and members of supervisory/management levels in spoken or written form.
- Adapt speech to accommodate socio-cultural sensitivities without losing own meaning.
- Organize and present Measurement, Control and Instrumentation information in a focused and coherent manner.
- Relationships with peers and supervisory/management levels are established and functioning.

Exit Level Outcome 5

The ability to collect, record and report Measurement, Control and Instrumentation information.

Associated Assessment Criteria

- Demonstrate an understanding of the SI units.
- Read and record Measurement, Control and Instrumentation variables.
- Use grammatical structures and writing conventions to draft an accurate report on Measurement, Control and Instrumentation information collected.

International Comparability

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

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.

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.

Articulation Possibilities

This is the first 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.

Accreditation and moderation

- 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 than the level of this qualification and registered with the relevant ETQA

National Certificate in Measurement, Control and Instrumentation (NQF Level 2)

Classification	Unit Standard Titles	NLRD	Level	Credits	Total
Fundamental	**Communication and Language Studies**				36
	Maintain and adapt oral communication	8962	2	5	
	Access and use information from text	8963	2	5	
	Write for a defined context	8964	2	5	
	Communicate at work	12461	2	5	
	Mathematics and Science				
	Measure, estimate and calculate physical quantities and explore, describe and represent geometrical relationships in two dimensions in different life or workplace context	12444	2	3	
	Demonstrate understanding of rational and irrational numbers and number systems within the context of relevant calculations	8982	2	3	
	Use mathematics to investigate and monitor the financial aspects of personal and community life	7469	2	2	
	Apply basic knowledge of statistics in order to investigate life and work related problems	14085	2	3	
	Work with a range of patterns and basic functions to solve related problems	9007	2	5	
	Sub-total				36
Core	Operate a personal computer system.	7547	2	6	83
	Identify, inspect, use, maintain and care for engineering hand tools	10252	1	6	
	Apply and maintain safety in an electrical environment	9839	1	5	
	Demonstrate an understanding of and maintain pressure equipment		2	6	
	Demonstrate an understanding of and maintain temperature equipment		2	6	
	Demonstrate an understanding of and maintain equipment associated with final control elements		2	6	
	Demonstrate an understanding of and maintain level equipment		2	6	
	Demonstrate an understanding of and maintain flow equipment		2	6	
	Read and interpret basic engineering drawings	9882	2	8	
	Select, use and care for electrical measuring instruments	10237	2	4	
	Understand fundamentals of electricity		2	8	
	Select, use and care for power tools	10255	1	5	

	Demonstrate an understanding of and install instrument impulse lines		2	6	
	Carry out soldering and de-soldering procedures		2	3	
	Sub-total				115
Elective	Perform basic welding/joining of metals	9880	2	8	24
	Render basic First Aid	12467	2	4	
	Perform Basic Fire Fighting	12468	2	4	(Min of 10)
	Demonstrate an understanding of HIV/AIDS and its implications	8494	2	4	
	Sling Loads	12481	2	4	
	Total				**137**
Total Credits					**Min. of 129 Credits**

TITLE: *Demonstrate an understanding of and maintain Pressure equipment*

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 2

CREDITS: 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Demonstrate an understanding of and maintain pressure equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Basic electrical safety

Use of hand tools

UNIT STANDARD RANGE

Measurement source includes but is not limited to pneumatic and hydraulic

The range of pressure equipment includes but is not limited to pressure gauges, impulse lines, pressure switches, pressure controllers, pressure recorders, pressure indicators.

Caring for pressure equipment includes but is not limited to removing, replacing, adjustment or setting up, cleaning, lubricating and tightening.

Safety precautions include the use of all personal protective equipment, electrical and fire protection, process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the planning for maintaining pressure equipment.

ASSESSMENT CRITERIA

1. The tools are correctly selected according to the job requirement.

2. The repair manuals, specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of pressure equipment are recognised and necessary precautions taken according to workplace and manufacturers procedures.

SPECIFIC OUTCOME 2

Demonstrate an understanding of safe working conditions when working with pressure equipment.

ASSESSMENT CRITERIA

1. The personal safety equipment is correctly selected and worn according to the job requirement.

2. The pre-operational checks are carried out according to the prescribed safety requirements.

3. The faulty and unsafe equipment is identified and reported to the relevant personnel.

SPECIFIC OUTCOME 3

Demonstrate an understanding of how to remove pressure equipment.

ASSESSMENT CRITERIA

1. The tools are correctly selected and set up according to job requirements.

2. The personal protective equipment applicable to the job is worn.

3. The tools are used correctly and safely in accordance with the job requirements and manufacturers specifications.

4. Correctly identify and isolate the process associated with Measurement, Control and Instrumentation and electrical equipment.

5. The pressure equipment is removed and cleaned according to workplace practices and/or manufacturer specifications.

SPECIFIC OUTCOME 4

Demonstrate an understanding of how to install pressure equipment.

ASSESSMENT CRITERIA

1. The pressure equipment is correctly installed according to workplace and manufacturers specifications.

2. The pressure equipment is inspected for incurred defects in accordance to workplace and manufacturers specifications.

3. Reinstate the process associated with Measurement, Control and Instrumentation and the electrical equipment.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of pressure equipment and their accessories.

Hazards and preventive precautions associated with pressure equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty pressure equipment and interpreting job requirements.

TITLE: **Demonstrate an understanding of and maintain Temperature equipment**

FIELD: Manufacturing Engineering and Technology

SUBFIELD Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 2

CREDITS 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Demonstrate an understanding of and maintain temperature equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Basic electrical safety

Use of hand tools

UNIT STANDARD RANGE

Measurement source includes but is not limited to Resistive temperature measurement sensors, thermocouple devices, pyrometers and thermometers.

The range of Temperature equipment includes but is not limited to temperature gauges, capillary tubes, temperature switches, temperature controllers, temperature recorders and temperature indicators.

Caring for Temperature equipment includes but is not limited to removing, replacing, adjustment or setting up, cleaning, lubricating and tightening.

Safety precautions include the use of all personal protective equipment, electrical and fire protection and process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the planning for maintaining temperature equipment.

ASSESSMENT CRITERIA

1. The tools are correctly selected according to the job requirement.

2. The repair manuals, specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of temperature equipment are recognised and necessary precautions taken according to workplace and manufacturers procedures.

SPECIFIC OUTCOME 2

Demonstrate an understanding of safe working conditions when working with temperature equipment.

ASSESSMENT CRITERIA

1. The personal safety equipment is correctly selected and worn according to the job requirement.

2. The pre-operational checks are carried out according to the prescribed safety requirements.

3. The faulty and unsafe equipment is identified and reported to the relevant personnel.

SPECIFIC OUTCOME 3

Demonstrate an understanding of how to remove temperature equipment.

ASSESSMENT CRITERIA

1. The tools are correctly selected and set up according to job requirements.

2. The personal protective equipment applicable to the job is worn.

3. The tools are used correctly and safely in accordance with the job requirements and manufacturers specifications.

4. Correctly identify and isolate the process associated with Measurement, Control and Instrumentation and electrical equipment.

5. The temperature equipment is removed and cleaned according to workplace practices and/or manufacturer specifications.

SPECIFIC OUTCOME 4

Demonstrate an understanding of how to install temperature equipment.

ASSESSMENT CRITERIA

1. The temperature equipment is correctly installed according to workplace and manufacturers specifications.

2. The temperature equipment is inspected for incurred defects in accordance to workplace and manufacturers specifications.

3. Reinstate the process associated with Measurement, Control and Instrumentation and the electrical equipment.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of temperature equipment and their accessories.

Hazards and preventive precautions associated with temperature equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty temperature equipment and interpreting job requirements.

TITLE: **Demonstrate an understanding of and maintain Equipment associated with final control elements**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

Level: 2

CREDITS: 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Demonstrate an understanding of and maintain Equipment associated with final control elements

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Basic electrical safety

Use of hand tools

UNIT STANDARD RANGE

Final control elements includes but is not limited to Pneumatic, Electric and hydraulic actuated vales, Power cylinders, Pneumatic to current converters.

The range of final control elements includes any device that changes the value of the measured variable including the associated control elements.

Caring for equipment associated with final control elements includes but is not limited to removing, replacing, adjustment or setting up, cleaning, lubricating and tightening.

Safety precautions include the use of all personal protective equipment, electrical and fire protection and process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the planning for maintaining equipment associated with final control elements.

ASSESSMENT CRITERIA

1. The tools are correctly selected according to the job requirement.

2. The repair manuals, specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of equipment associated with final control elements are recognised and necessary precautions taken according to workplace and manufacturers procedures.

SPECIFIC OUTCOME 2

Demonstrate an understanding of safe working conditions when working with equipment associated with final control elements.

ASSESSMENT CRITERIA

1. The personal safety equipment is correctly selected and worn according to the job requirement.

2. The pre-operational checks are carried out according to the prescribed safety requirements.

3. The faulty and unsafe equipment is identified and reported to the relevant personnel.

SPECIFIC OUTCOME 3

Demonstrate an understanding of how to remove equipment associated with final control elements.

ASSESSMENT CRITERIA

1. The tools are correctly selected and set up according to job requirements.

2. The personal protective equipment applicable to the job is worn.

3. The tools are used correctly and safely in accordance with the job requirements and manufacturers specifications.

4. Correctly identify and isolate the process associated with Measurement, Control and Instrumentation and electrical equipment.

5. The equipment associated with final control elements is removed and cleaned according to workplace practices and/or manufacturer specifications.

SPECIFIC OUTCOME 4

Demonstrate an understanding of how to install equipment associated with final control elements.

ASSESSMENT CRITERIA

1. The equipment associated with final control elements is correctly installed according to workplace and manufacturers specifications.

2. The equipment associated with final control elements is inspected for incurred defects in accordance to workplace and manufacturers specifications.

3. Reinstate the process associated with Measurement, Control and Instrumentation and the electrical equipment.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of Equipment associated with final control elements and their accessories.

Hazards and preventive precautions associated with Equipment associated with final control elements.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty Equipment associated with final control elements and interpreting job requirements.

TITLE: **Demonstrate an understanding of and maintain Level equipment**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 2

CREDITS: 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Demonstrate an understanding of and maintain Level equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Basic electrical safety

Use of hand tools

UNIT STANDARD RANGE

Measurement source includes but is not limited to Nuclear meters, Ultrasonic, Radio Frequency, Differential pressure equipment, Radar, Magnetic, Optic, Capacitance.

The range of Level equipment includes but is not limited to Level meters, Level switches, Level controllers, Level recorders, Level indicators, Level gauges.

Caring for Level equipment includes but is not limited to removing, replacing, adjustment or setting up, cleaning, lubricating and tightening.

Safety precautions include the use of all personal protective equipment, electrical and fire protection and process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the planning for maintaining Level equipment.

ASSESSMENT CRITERIA

1. The tools are correctly selected according to the job requirement.

2. The repair manuals, specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of level equipment are recognised and necessary precautions taken according to workplace and manufacturers procedures.

SPECIFIC OUTCOME 2

Demonstrate an understanding of safe working conditions when working with Level equipment.

ASSESSMENT CRITERIA

1. The personal safety equipment is correctly selected and worn according to the job requirement.

2. The pre-operational checks are carried out according to the prescribed safety requirements.

3. The faulty and unsafe equipment is identified and reported to the relevant personnel.

SPECIFIC OUTCOME 3

Demonstrate an understanding of how to remove Level equipment.

ASSESSMENT CRITERIA

1. The tools are correctly selected and set up according to job requirements.

2. The personal protective equipment applicable to the job is worn.

3. The tools are used correctly and safely in accordance with the job requirements and manufacturers specifications.

4. Correctly identify and isolate the process associated with Measurement, Control and Instrumentation and electrical equipment.

5. The level equipment is removed and cleaned according to workplace practices and/or manufacturer specifications.

SPECIFIC OUTCOME 4

Demonstrate an understanding of how to install Level equipment.

ASSESSMENT CRITERIA

1. The level equipment is correctly installed according to workplace and manufacturers specifications.

2. The level equipment is inspected for incurred defects in accordance to workplace and manufacturers specifications.

3. Reinstate the process associated with Measurement, Control and Instrumentation and the electrical equipment.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of Level equipment and their accessories.

Hazards and preventive precautions associated with Level equipment.

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty Level equipment and interpreting job requirements.

TITLE: Demonstrate an understanding of and maintain Flow equipment

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID

NQF LEVEL: 2

CREDITS: 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Demonstrate an understanding of and maintain Flow equipment

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:
Safety procedures according to statutory and manufacturer requirements
Basic electrical safety
Use of hand tools

UNIT STANDARD RANGE

Measurement source includes but is not limited to Turbine meters, Positive displacement meters, Differential pressure equipment, Magnetic Flow, Ultra Sonic.

The range of Flow equipment includes but is not limited to Flow meters, Flow switches, Flow controllers, Flow recorders, Flow indicators, Flow computers.

Caring for Flow equipment includes but is not limited to removing, replacing, adjustment or setting up, cleaning, lubricating and tightening.

Safety precautions include the use of all personal protective equipment, electrical and fire protection and process isolation.

Statutory requirements include but are not limited to SANS, OSH Act and manufacturers specifications.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Demonstrate an understanding of the planning for maintaining Flow equipment.

ASSESSMENT CRITERIA

1. The tools are correctly selected according to the job requirement.

2. The repair manuals, specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of flow equipment are recognised and necessary precautions taken according to workplace and manufacturers procedures.

SPECIFIC OUTCOME 2

Demonstrate an understanding of safe working conditions when working with Flow equipment.

ASSESSMENT CRITERIA

1. The personal safety equipment is correctly selected and worn according to the job requirement.

2. The pre-operational checks are carried out according to the prescribed safety requirements.

3. The faulty and unsafe equipment is identified and reported to the relevant personnel.

SPECIFIC OUTCOME 3

Demonstrate an understanding of how to remove Flow equipment.

ASSESSMENT CRITERIA

1. The tools are correctly selected and set up according to job requirements.

2. The personal protective equipment applicable to the job is worn.

3. The tools are used correctly and safely in accordance with the job requirements and manufacturers specifications.

4. Correctly identify and isolate the process associated with Measurement, Control and Instrumentation and electrical equipment.

5. The flow equipment is removed and cleaned according to workplace practices and/or manufacturer specifications.

SPECIFIC OUTCOME 4

Demonstrate an understanding of how to install Flow equipment.

ASSESSMENT CRITERIA

1. The flow equipment is correctly installed according to workplace and manufacturers specifications.

2. The flow equipment is inspected for incurred defects in accordance to workplace and manufacturers specifications.

3. Reinstate the process associated with Measurement, Control and Instrumentation and the electrical equipment.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of power tools including the use of personal protective equipment, electrical and fire protection.

Names, locations and functions of Flow equipment and their accessories.

Hazards and preventive precautions associated with Flow equipment.

Company quality standards.

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - faulty equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting faulty Flow equipment and interpreting job requirements.

TITLE: **Demonstrate an understanding of and install Instrument impulse lines.**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 2

CREDITS: 6

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Safely identify, select, inspect, install and maintain Instrument impulse lines.
Demonstrate knowledge of different types and applications of Instrument impulse lines
Test for leaks and blockages

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Use of hand tools

UNIT STANDARD RANGE

Statutory requirements include but are not limited to: Occupational Health and Safety Act, Local Authorities requirements and manufacturers specifications.

Instrument impulse lines including all associated fittings.

Safety precautions include the use of all appropriate personal protective equipment, electrical and fire protection.

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Select and Inspect Instrument impulse lines

ASSESSMENT CRITERIA

1. The Instrument impulse lines are correctly selected according to the job requirement.

2. The maintenance manuals, specifications and drawings are correctly selected according to the job requirement.

3. The hazards associated with the use of instrument impulse lines are recognised and necessary precautions taken according to work site procedures.

4. The damaged and unsafe instrument impulse lines are identified and accurately reported to the relevant personnel.

SPECIFIC OUTCOME 2

Demonstrate knowledge of different types and applications of Instrument impulse lines

ASSESSMENT CRITERIA

1. Accurately identify various types of Instrument impulse lines.

2. Identify various applications for different types of Instrument impulse lines and their associated procedures.

3. Identify applicable safety precautions than need to be taken when using various types of Instrument impulse lines.

SPECIFIC OUTCOME 3

Maintain Instrument impulse lines.

ASSESSMENT CRITERIA

1. Check that instrument impulse lines are correctly installed in accordance with manufacturer specifications and applicable safety requirements.

2. Clean, inspect and replace damaged instrument impulse lines.

3. Test for and repair instrument impulse lines for leaks.

4. Deviations from standards are recorded and reported to the relevant personnel.

SPECIFIC OUTCOME 4

Install and Commission Instrument impulse lines

ASSESSMENT CRITERIA

1. Correctly set-up instrument impulse lines for installation according to workplace and manufacturer specifications.

2. Install and test instrument impulse lines according to prescribed standards.

3. Record deviations from prescribed standards and take corrective action.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of Instrument impulse lines including the use of personal protective equipment, electrical and fire protection.

Locations of Instrument impulse lines and their accessories.

Hazards and preventive precautions associated with Instrument impulse lines

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - damaged equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting damaged Instrument impulse lines and interpreting job requirements.

TITLE: **Carry out soldering and de-soldering procedures.**

FIELD: Manufacturing Engineering and Technology

SUBFIELD: Engineering and related design

UNIT STANDARD ID:

NQF LEVEL: 2

CREDITS: 3

PURPOSE OF THE UNIT STANDARD

This unit standard is for persons in the Manufacturing Engineering and Technology field.

A person credited with this unit standard will be able to:

Safely identify, select, inspect and carry out soldering/de-soldering operations.
Demonstrate knowledge of different soldering techniques
Clean and store soldering material and equipment
Dispose of waste material

This unit standard will contribute to the full development of the learner within the Measurement Control and Instrumentation environment by providing recognition, further mobility and transportability within the field of Manufacturing Engineering and Technology. The skills, knowledge and understanding demonstrated within this unit standard are essential for social and economic transformation and upliftment within the Measurement Control and Instrumentation environment.

LEARNING ASSUMED TO BE IN PLACE

The following knowledge, skills attitude and / or equivalent:

Safety procedures according to statutory and manufacturer requirements

Use of hand tools

UNIT STANDARD RANGE

Statutory requirements include but are not limited to: Occupational Health and Safety Act, Local Authorities requirements and manufacturers specifications as they relate to the Measurement, Control and Instrumentation environment.

Soldering Equipment including associated tools and protective devices.

Safety precautions include the use of all appropriate personal protective equipment.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA:

SPECIFIC OUTCOME 1

Select equipment and materials for soldering/de-soldering

ASSESSMENT CRITERIA

1. The correct soldering equipment is selected according to the job requirement.

2. The maintenance manuals, specifications and drawings are correctly selected according to the job requirements.

3. Hazards associated with the use of Soldering Equipment are recognised and necessary precautions taken according to work site procedures.

4. Damaged and unsafe Soldering Equipment are identified and reported to the relevant personnel.

SPECIFIC OUTCOME 2

Apply soldering/de-soldering techniques

ASSESSMENT CRITERIA

1. Connections are carefully and correctly cleaned from any dirt or oxidation using the appropriate cleaning materials.

2. The correct soldering/de-soldering techniques for the job are used.

3. The correct Personal Protective Equipment is used and applicable safety precautions are taken when soldering/de-soldering is carried out.

SPECIFIC OUTCOME 3

Inspect solder joint.

ASSESSMENT CRITERIA

1. Ensure that the soldered joints are not dull in color and does not have excessive resin.

2. Ensure the soldered joints do not contain solder globules or insufficient solder that will cause a poor electrical or mechanical connection.

3. Ensure that components or soldering substrate is not scorched by excessive heat.

SPECIFIC OUTCOME 4

Clean & store materials and equipment

ASSESSMENT CRITERIA

1. Soldering Equipment is carefully and correctly cleaned according to workplace and manufacturers instructions.

2. Soldering material and equipment is stored correctly according to workplace and manufacturers instructions.

3. Waste is disposed of correctly according to workplace and manufacturers instructions taking environmental awareness into account.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.

Any institution offering learning that will enable achievement of this unit standard must be accredited as a provider through the relevant ETQA by SAQA.

Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Workshop procedures including house keeping practices according to statutory requirements.

Specific work site safety practices relating to the use of Soldering Equipment including the use of personal protective equipment.

Locations of Soldering Equipment and their accessories.

Hazards and preventive precautions associated with soldering

Company quality standards.

CRITICAL CROSS-FIELD OUTCOMES (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identification and problem solving skills - damaged equipment identified and reported.

UNIT STANDARD CCFO WORKING

Work effectively with others - working under supervision.

UNIT STANDARD CCFO COMMUNICATING

Communication skills - reporting damaged Soldering Equipment and interpreting job requirements.