No. 611 **29 May 2009**

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

Manufacturing and Assembly Processes

registered by Organising Field 06 – Education,Training and Development, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and 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, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and ***no later than 29 June 2009.*** All correspondence should be marked **Standards Setting – SGB for Manufacturing and Assembly Processes** and addressed to

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D. MPHUTHING
ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate: Electronics Manufacturing and Assembly

SAQA QUAL ID	*QUALIFICATION TITLE*		
67569	National Certificate: Electronics Manufacturing and Assembly		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
National Certificate	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	132	Level 2	Regular-Unit Stds Based

This qualification does not replace any other qualification and is not replaced by another qualification.

PURPOSE AND RATIONALE OF THE QUALIFICATION
Purpose:

This Qualification intends to set standards for a typical learner entering the field of electronics manufacture and assembly. It will provide learners with foundational knowledge and experiential skills which will enable them to perform in this field. It will be valuable to learners who may have been working or practising within the electronics manufacture and assembly field such as shop floor workers who do not have a formal education and any person wishing to join the electronics manufacture and assembly environment thus providing learners with the opportunity for formal recognition of their skills and knowledge through Recognition of Prior Learning (RPL).

The Qualification is structured in such a way that it enables learners to gain progression towards the higher NQF Level Qualifications thus creating career opportunities for learners within the electronics assembly and manufacture environment. The Unit Standards contained in this Qualification will provide building blocks for specific skills that provide access to related Qualifications in this field as well as providing articulation possibilities.

This Qualification is the first in the learning pathway for the electronics manufacture and assembly field and articulates vertically to the planned NQF Level 3, National Certificate: Electronics; NQF Level 4, Further Education and Training Certificate: Electronics, National Certificate: Electronics, NQF Level 5 and a National Diploma: Electronics at NQF Level 5. The Qualification also provides horizontal articulation to electronics related Qualifications within the telecommunications and electronics servicing industries.

A learner acquiring this Qualification will be able to:

- Use verbal and written practices to communicate in the workplace and apply mathematical processes to solve everyday numerical problems.
- Apply elementary principles of computers and their use in electronics.
- Demonstrate knowledge of electronic components, instruments and test equipment.
- Assemble components to create an electronic product.
- Apply safety measures in an electronics assembly and manufacturing environment.

Qualifying learners will be able to show responsibility and independency and effectively manage themselves in an electronics manufacturing and assembly environment by providing technical support and service during the production process.

Rationale:

Electronics manufacture and assembly is a specialised field that requires specific knowledge and skills to be able to operate productively within the sector. People working on production, manufacturing and operation lines such as assemblers need this Qualification to assist them to operate effectively within the parameters of legislative and regulatory frameworks governing this sector. It will also provide learners with the relevant knowledge, skills, values and attitudes which will enhance their growth opportunities as well as improving the overall level of quality of workmanship within this sector. Currently there is no targeted electronics assembly and manufacturing Qualification existing at an introductory level that will develop key competencies (knowledge, skills, attitudes and values) required in this environment.

It will benefit individuals at work, as it is mostly occupational-oriented thus providing learners with knowledge and skills to enable them to meet global electronics assembly and manufacturing standards at an introductory level. This Qualification will facilitate articulation to other Qualifications which include mechatronics, autotronics and electronic warfare thus facilitating mobility, personal growth within the electronics field and improve productivity. Learners will have a working understanding of elementary principles within the electronics assembly and manufacturing sector.

RECOGNIZE PREVIOUS LEARNING?
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LEARNING ASSUMED IN PLACE
- Mathematical Literacy at NQF Level 1.
- Communication at NQF Level 1.

Recognition of Prior Learning:

The Qualification can be achieved in whole or part through the Recognition of Prior Learning (RPL). Learners obtaining the whole Qualification through RPL and wishing to be declared competent are required to complete a practical assessment component for the purpose of such recognition. This implies that the Qualification may be granted to learners who have acquired the skills and knowledge without attending formal courses, providing they can demonstrate competence in the outcomes of the individual Unit Standards as required by the Fundamental, Core and Elective components stipulated in the Qualification and by the Exit Level Outcomes.

Learners submitting themselves for RPL should be thoroughly briefed prior to the assessment, and may be required to submit a Portfolio of Evidence (POE) in the prescribed format and/or undergo a workplace assessment to be assessed for formal recognition. While this is primarily a workplace-based Qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the Exit Level Outcomes.

Access to the Qualification:

Access is open to all learners. It is however preferable that the learners first complete a GETC Qualification before accessing this Qualification.

QUALIFICATION RULES
The Qualification is made up of a combination of learning outcomes from Fundamental, Core and Elective components, totalling a minimum of 132 Credits:

Fundamental component:

- All Unit Standards to the value of 36 credits are compulsory.

Core component:

- All Unit Standards to the value of 83 credits are compulsory.

Elective component:

The Elective component consists of a number of Unit Standards from which learners are required to choose a combination totalling a minimum of 13 Credits. However, learners wishing to qualify in a specific electronics assembly and manufacturing stream are required to complete one of the following sets of Elective Unit Standards:

Casting and moulding:

- ID 264998: Produce an ear mould and shell, 14 Credits.

Sound and Acoustics:

- ID 244590: Describe and explain sound generation and propagation, 3 Credits.
- ID 265004: Explain sound and acoustics, 10 Credits.

Logistics:

- ID 259737: Complete finishing operations and dispatch product, 12 Credits.
- ID 114891: Count stock for a stock-take, 5 Credits.
- ID 265001: Maintain stock levels of equipment and consumables, 4 Credits.

Using Tools:

- ID 119744: Select, use and care for engineering hand tools, 8 Credits.
- ID 12219: Select, use and care for engineering power tools, 6 Credits.

Additional specialisations for other sectors in which Electronic manufacturing and assembly that are applicable will be added to this Qualification as they are finalised.

EXIT LEVEL OUTCOMES

1. Use verbal and written practices to communicate in the workplace and apply mathematical processes to solve everyday numerical problems.

2. Apply elementary principles of computers and their use in electronics.

3. Demonstrate knowledge of electronic components, instruments and test equipment (hand skills).

4. Assemble components to make an electronic product.

5. Apply safety measures in an electronics assembly and manufacturing environment.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

1.1 Information from texts, reports and standard operating procedures is practically applied in the workplace in diesel, diesel electric and electric fitting context.
1.2 Communications are addressed and responded to in accordance with the relevant workplace requirements.
1.3 Numerical conversions, calculations and measurements are performed as required in the workplace.
1.4 Workplace signs are interpreted and explained as required by specific worksites.
1.5 Solutions to problems are found based on a clear analysis of information gathered through simple repetitive diagnostic procedures.

Associated Assessment Criteria for Exit Level Outcome 2:

2.1 Computer hardware and software is used by employing relevant theories to solve practical electronics problems.
2.2 The computer's features are used to solve practical electronic manufacturing and assembly problems.

Associated Assessment Criteria for Exit Level Outcome 3:

3.1 Basic electronics components are explained in terms of their various functions in circuits.
3.2 The operation of circuits is explained for the production of electronic products.
3.3 Measuring instruments are identified and used in interpret various measurements and readings.
3.4 Probable causes affecting the malfunctioning of electronic products are identified and prioritized in order to ensure a methodical approach to resolving problems.

Associated Assessment Criteria for Exit Level Outcome 4:

4.1 Diagrams and part lists are read and interpreted for the manufacturing and assembling of electronic products.
4.2 Electronic and digital circuits are explained in terms of the function and use.
4.3 Quality of work and product is monitored and checked in an electronics manufacturing and assembling environment in order to meet specifications.
4.4 Post production operations are carried out in accordance with standards and specifications.

Associated Assessment Criteria for Exit Level Outcome 5:

5.1 Occupational Health and Safety policies and procedures are applied in the carrying out of the work.
5.2 Occupational Health and Safety policies and procedures, and safe work practices are followed to eliminate or minimise dangerous incidents.
5.3 Personnel protective equipment needed to do the work are identified and checked to ensure it is safe to use in accordance with standard operating procedures.

INTERNATIONAL COMPARABILITY

The purpose of this International Comparability study is to facilitate the development of a meaningful learning path and its associated curriculum incorporating both theoretical and practical vocational skills which will ensure compatibility, comparability and compliance with existing international Qualification specifications and regulations.

Electronics is a highly recognised sector, in that the modern world relies on electrical and electronics devices which impact considerably in the domestic and world of work today. Internet research was conducted to identify similar Qualifications and/or programmes offered in different countries to determine how this Qualification compares with international Qualifications in electronics in terms of scope, level and outcomes as well as considering the nature of countries compared in relation to the history of offering education and training in this subject from socio-

economic perspectives. Due to the fact that the electrical and electronic engineering field is broad and vibrant thus interfacing with physics, computer science and engineering, the comparison was made on Qualifications/courses that deal with basic electronics and electrical engineering, which include electronic components. The approach used was to determine the international best practice in the comparison of the South African Qualification against the international ones.

This National Certificate was compared with equivalent Qualifications/courses from a range of countries. The countries were selected because they offer education and training that is considered international best practice in terms of electronics assembly and manufacturing. These countries are India, United States of America, United Kingdom, Netherlands and Canada. Countries such as Japan, China and India are considered to be leading in electronics products, but unfortunately their Qualifications in Electronics offered at this level could not be accessed. The research conducted in most countries indicated that Qualifications offered were engineering Qualifications of which electronics form part, were predominantly pitched at Degree, Honours, Masters and PHD levels, which made it difficult to find an introductory Electronics Manufacturing and Assembly Qualification at an entry Level (Level 2).

Below are the Qualifications/programmes/courses that were used in the comparison:
India (Bangalore, Gurgaon, Pune, Mumbai and Chennai):

Siemens PLM Software:

Course Title: NX Advanced Assemblies:

- Simplified representations.
- Component filters.
- Zone creation and management.
- Clearance analysis.
- Weight management.
- Application-specific topics.
- Design in context of large assemblies.
- Create drawings of large assemblie.
- Design review of large assemblies.

The NX Advanced Assemblies course does not compare well with this Qualification as it is pitched at a higher level and covers management issues and design work related to assembling.

North America and Asia:

Omnex Business Development:

Course Title: Unified Lean/Six Sigma Champion Training:

- Understanding the Lean and Six Sigma Movements.
- Benefits of Lean and Six Sigma.
- Benefits of integrating Lean and Six Sigma.
- Lean and Six Sigma organisational structure.
- Customer focus.
- Understanding Lean and Six Sigma tools.
- The Breakthrough Strategy.
- Process Mapping.
- Basic statistics.
- Capability analysis.
- Design of experiments.
- Design for Six Sigma.

- Project selection and planning.
- How to get started.
- Case studies.

Course Title: Lean Project Management and Overall Equipment Effectiveness:

- Develop the knowledge and skills for leading project teams.
- Develop the knowledge and skills to manage Overall Equipment Effectiveness.
- The philosophy and process for achieving workplace organisation.
- Conduct a campaign to clean and organise locations in the plant.
- Utilise Visual Management methods to control process performance.

Course Title: Achieving Continuous Flow; Cellular Manufacturing and Assembly:

- Develop the knowledge of the theory, process and tools of continuous flow processing.
- Apply continuous flow processing in a live situation.
- Identify and quantify cost savings from continuous flow projects.

The three courses offered by Omnex Business Development do not compare favourably with this South African Qualification. They offer a more specific subject/method of manufacturing and assembly (LEAN) as opposed to more generic competencies. There is however similarity in terms of learning such as customer service and working on a production line.

Canada:

George Brown College: Toronto:

Course Title: Electronics Technician Certificate:

- Introduction to Electronics.
- Current, Voltage and Resistance.
- Ohm`s Law, Power and Energy.
- Series Circuits.
- Parallel Circuits.
- Series Parallel Circuits.
- DC Measuring Instruments.
- Network Theorems.
- Magnetism.
- Magnetic Circuits.
- Alternating Voltage and Current.
- Digital Electronics.
- AC Measuring Instruments.
- Capacitance and Capacitors.
- Inductance and Inductors.
- Transformers.
- Alternating Current Circuits.
- Resonance.
- Semiconductor Fundamentals.
- Coupling and Filter Circuits.
- Transistors and Thyristors.
- Amplifier Circuits.
- Integrated Circuits.

George Brown College offers the Electronics Technician Certificate programme that is targeting technicians who work in the field of consumer, commercial and industrial electronics. Many

schools and organisations, which have adopted it as part of their training programmes, use this programme as part of their curriculum. People who intend to work within the electronics environment thus will be preparing themselves for employment can also access the programme. The programme is offered on a modular basis with at least 23 modules. The duration of the programme is 32 weeks. Many of the Modules offered here compare favourably with our South African Qualification except that some of the Modules are at a higher level and may be found in the Level 3 Electronics Qualification.

Automated Learning: Ontario:

Course Title: Electronic assembly Consulting and Training:

- Electrostatic discharge control programme management.
- Electrostatic discharge class zero implementation.
- Surface mount technology (SMT).
- Through hole assembly.
- Solder and rework.
- Lead-free solder process transition.
- Mechanical assembly and box build.
- Cellular manufacturing.
- Quality and inspection.
- Lean manufacturing production process.

The above training and development has some aspects that are included in the Level 2 Qualification and therefore compares well in these areas. However it also covers additional subjects which will be found at higher levels.

USA:

San Diego Community College District:

Course Title: Basic Electronic Assembly:

- The use and care of tools.
- The use and care of hardware.
- Electronic components.
- Connecting and soldering electronic components.
- Safety practices.
- Workmanship standards.
- Colour coding.
- Blueprint reading.
- Harnessing.
- Wire wrapping.

San Diego Community College District course in Basic Electronic Assembly is designed for people who are interested in electronics manufacturing and assembly and who may wish to pursue further training and employment in this field. It is a 390 hours course. Some of the modules contained in this Qualification compares favourably with the South African Qualification as it addresses basic knowledge and skills in the electronic manufacturing and assembly environment, although the use and care of tools are an Elective component in the South African NQF Level 2 Qualification.

Electronics Supply Centre: Washington State:

Course Title: Basic Electronics for Schools:

- Lesson 1: Basic electronics theories and principles; Magnetism; The Atom; Rectifying circuits.
- Lesson 2: Series Circuits; Sine Wave Voltages; Diodes; Filtering.
- Lesson 3: Parallel Circuits; Basic principles of Capacitors; Bipolar Junction Transistors (NPN and PNP); Regulators (I.C Regulator circuits, switch mode regulators).
- Lesson 4: Combination Circuits; Capacitors (reactance and various types of capacitors; Field Effect Transistors; UPS System (uninterruptible power supplies).
- Lesson 5: Rheostats, symbols of variables and potentiometers; Inductors (self induced voltages and calculation of inductors in series; Specialty Devices (Semi-conductor devices).
- Lesson 6: Inductors (Autotransformers).
- Lesson 7: RLC Circuits.

The above course compares favourably with the South African Qualification as it provides basic knowledge packaged for beginners in the electronics field. The course is divided into different lessons in each module. These lessons can be benchmarked against the Unit Standards contained in the South African Qualification that provides learners with key competencies contained in the lessons provided in each module.

Skagit Valley College: Washington State:

Course Title: Electronics Fundamentals, 5 credits:

- Departmental standards on laboratory conduct, reporting, and safety.
- Ohm's law.
- Watt's law.
- Series circuits.
- Parallel circuits.
- Series-parallel circuits.
- Computer solutions.
- Voltage and current dividers.
- Resistance, voltage and current meters.
- Conductors and insulators.
- Kirchoff's voltage law.
- Kirchoff's current law.
- Network theorems.

Course Title: Electronic Fundamentals, 5 credits:

- Organisational standards on laboratory conduct, reporting and safety.
- Review of DC concepts.
- Introduction to AC Theory.
- Inductors and Capacitors.
- Reactance and Impedance.
- RL,RC and RLC circuit analysis and characteristics.

The above courses compare well with this Qualification as they provide the foundational knowledge which beginners in the electronics manufacturing and assembly field require and it provides the basic knowledge required to function competently in this field. These courses are divided into different subjects which can be benchmarked against the Unit Standards that provide learners with key competencies required in the Level 2 Qualification.

Fiji Islands, South Pacific:

Fiji Institute of Technology: School of Electrical and Electronic Engineering:

Course Title: Trade Certificate in Electronics Engineering:

- Basic electronics.
- Applied mathematics.
- Electrical principles.
- Electronics fundamentals.
- Electrical measurements.
- Occupational, Health and Safety.
- Digital electronics.
- Analogue electronics.
- Components and measurements.
- Computer applications.
- Technical communication.
- Workshop practice.
- Electronics projects.

This highly recognised institution that is registered as an Academy and that offers very dynamic comprehensive programmes to school leavers who wish to pursue training in electrical and electronic engineering and their allied industries. The above programme only compares fairly well with this South African Qualification at NQF Level 2 as the content offered has some that are the same. However the bulk of the course contents are at a higher level. The Applied Mathematics section's level is not known.

United Kingdom:

MYDATA Automation Ltd; (MYSMT Process Courses):

Course Title: Introduction to Electronics (E-learning course):

- History of electronics assembly.
- Electronics production on base of conventional assembly.
- The transition from conventional assembly to SMD assembly.
- The foundations for the transition into SMT.
- Knowledge about different materials, conventional components, SMT components and different packages.
- Safe handling of materials.

The above course compares favourably with this Level 2 Qualification as it provides a basic knowledge of electronics assembly. It must be noted however, that this course is concluded with a written examination made up of multiple choice and open questions, so learners are not assessed against any of the competencies required by people within the electronics manufacturing and assembly industry.

Edexcel:

Course Title: BTEC National Certificate in Electrical/Electronic Engineering (4322):

- Electrical and Electronic principles.
- Digital electronics.
- Analogue electronics.
- Electronic fault finding.
- Further Electrical Principles.
- Health, Safety and Welfare.

Edexcel is known to be the largest awarding body in the United Kingdom, which develops a diverse range of vocational and academic Qualifications including short courses. The BTEC

National Certificate in Electrical/Electronic Engineering is at the UK NQF Level 3, which has an equivalence level between our NQF Levels 4 and 5. It therefore does not really compare well with this Level 2 Qualification.

New Zealand:

Electro Technology Industry Training Organisation:

Course Title; National Certificate in Electronics Technology, Level 3:

- Demonstrate and apply knowledge of basic semiconductor devices.
- Demonstrate basic knowledge of basic digital and analogue electronic concepts.
- Describe the development of a new electronic product.
- Demonstrate basic knowledge of signals and the transmission of information.
- Demonstrate basic knowledge of electronic product quality and reliability.
- Demonstrate and apply basic knowledge of microcontrollers.

This Qualification is designed for people who are interested in electronics who may wish to pursue further training and employment in this field. The Qualification has been developed for people interested in electronics who may wish to pursue further training and employment in this field and is offered in high schools. Some of the units standards contained in this Qualification compares favourably with the South African Qualification as it addresses basic knowledge and skills of electronics although it is comprised of only 43 credits.

In addition, there are unit standards identified which do not form part of any Qualification within the New Zealand Qualifications Framework pegged at NQF Level 3 which is core electronics for electronics technicians that compare favourably with our Qualification. These are:

- Demonstrate and apply introductory knowledge of D.C. principles for electronics technicians.
- Demonstrate and apply introductory knowledge of A.C. principles for electronics technicians.
- Demonstrate and apply introductory knowledge of digital electronics for electronics technicians.
- Demonstrate and apply introductory knowledge of analogue electronics for electronics technicians.

Netherlands:

PIEK International education Centre:

Course Title: Hybrid Integrated Circuits Design for Manufacturing and Assembly Thick Film:

- Understanding Think film Hybrid Integrated Circuits Design.
- Applicable documentation.
- Base materials.
- Thick film technology.
- Thick film-hybrid circuit process.
- Trends in electronics and influence on hybrid integrated circuit design.
- Quality assurance.
- Verifying the design-cost.

This programme basically only focuses on thick film technology and therefore does not compare all that well with the South African Qualification. It must be noted however that the competencies gained will be similar and therefore valuable and it is targeting individuals who are interested in a career in the electrical and electronics industries as well as offering the stepping-stone to gain broad education and training in this field.

Zimbabwe:

In relation to SADC countries, it has been discovered that countries in the SADC region tend to benchmark their Qualifications against the South African Qualifications. The only country found to provide a programme in the subject field is Zimbabwe through SIRDC (Electronics and Communications Institute) which offers technology transfer and training services in specialised areas of electronics, electronics circuit design and electronic instrumentation which does not compare fairly well with the standards offered by the South African Qualification in that the content/modules of their programme that is partly relevant to our Qualification but not addressed at this level are:

- Electronic circuit design fundamentals.
- Electronic instrumentation and control.

Conclusion:

Comparing our own Qualification with other countries, it seems clear that we are operating at an equivalent level with other countries, including those which are leaders in this field, as well as taking into account the particular requirements of developing nations, including our own. This Qualification falls well within the occupational profiles and training standards of the other relevant countries that we have investigated and offers the additional detail of introducing the very basics of electronics manufacturing and assembly to learners, therefore empowering them to find employment and grow within this industry.

ARTICULATION OPTIONS

Horizontal articulation is possible with:

- ID 63789: National Certificate: Electrical Engineering, NQF Level 2.
- ID 22858: National Certificate: Autotronics, NQF Level 2.
- ID 22770: National Certificate: Mechatronics, NQF Level 2.
- ID 58781: National Certificate: Production Technology, NQF Level 2.

Vertical articulation is possible with:

- ID 59696: National Certificate: Electronics, NQF Level 3.
- ID 48475: National Certificate: Electrical Engineering, NQF Level 3.
- ID 22859: National Certificate: Autotronics, NQF Level 3.
- ID 22791: National Certificate: Mechatronics, NQF Level 3.
- ID 58785: National Certificate: Production Technology, NQF Level 3.
- ID 22936: Certificate: Electronics Servicing Technology, NQF Level 3.
- ID 22939: Certificate: Telecommunications and Electronics Engineering, NQF Level 3.

MODERATION OPTIONS

- Anyone 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 of 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 ETQA's policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQA's (including professional bodies); and in terms of moderation guideline detailed in "Qualification Assessor Criteria.

- Moderation must include both internal and external moderation of assessments at exit points of the Qualification, unless ETQA policies specifies 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.

• Anyone wishing to be assessed against this Qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS
For an applicant to register as an assessor, the applicant should:

• Be registered as an assessor with the relevant ETQA.
• Be in possession of a relevant Qualification at NQF Level 3 or higher.

NOTES
N/A

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119463	Access and use information from texts	Level 2	5
Fundamental	9009	Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to investigate life related problems	Level 2	3
Fundamental	7480	Demonstrate understanding of rational and irrational numbers and number systems	Level 2	3
Fundamental	9008	Identify, describe, compare, classify, explore shape and motion in 2-and 3-dimensional shapes in different contexts	Level 2	3
Fundamental	119454	Maintain and adapt oral/signed communication	Level 2	5
Fundamental	119460	Use language and communication in occupational learning programmes	Level 2	5
Fundamental	7469	Use mathematics to investigate and monitor the financial aspects of personal and community life	Level 2	2
Fundamental	9007	Work with a range of patterns and functions and solve problems	Level 2	5
Fundamental	119456	Write/present for a defined context	Level 2	5
Core	116932	Operate a personal computer system	Level 1	3
Core	117902	Use generic functions in a Graphical User Interface (GUI)-environment	Level 1	4
Core	114974	Apply the basic skills of customer service	Level 2	2
Core	265003	Assemble components	Level 2	12
Core	14359	Behave in a professional manner in a business environment	Level 2	5
Core	114605	Carry out soldering and de-soldering procedures	Level 2	3
Core	265000	Complete post-production and finishing operations	Level 2	6
Core	264996	Construct and test basic electronic circuits	Level 2	16
Core	243705	Demonstrate an understanding of quality procedures and practices	Level 2	10
Core	259639	Explain basic health and safety principles in and around the workplace	Level 2	4
Core	265006	Monitor the quality of materials and the manufactured product	Level 2	4
Core	13221	Perform routine maintenance	Level 2	8
Core	253074	Demonstrate an understanding of basic digital circuits	Level 3	6
Elective	259737	Complete finishing operations and dispatch product	Level 2	12
Elective	114891	Count stock for a stock-take	Level 2	5
Elective	265001	Maintain stock levels of equipment and consumables	Level 2	4
Elective	264998	Produce an ear mould and shell	Level 2	14
Elective	119744	Select, use and care for engineering hand tools	Level 2	8
Elective	12219	Select, use and care for engineering power tools	Level 2	6
Elective	244590	Describe and explain sound generation and propagation	Level 3	3
Elective	265004	Explain sound and acoustics	Level 3	10

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION
None

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Construct and test basic electronic circuits

SAQA US ID	*UNIT STANDARD TITLE*		
264996	Construct and test basic electronic circuits		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	16

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
12218	Construct and test basic electronic circuits	Level 2	16	Will occur as soon as 264996 is registered

SPECIFIC OUTCOME 1
Discuss and explain the principles of electronics.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the operation of basic electronic circuits.

SPECIFIC OUTCOME 3
Select electronic and related components for circuit construction.

SPECIFIC OUTCOME 4
Construct basic electronic circuits.

SPECIFIC OUTCOME 5
Test electronic circuits.

SPECIFIC OUTCOME 6
Report incidents and problems related to electronic work.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	67569	National Certificate: Electronics Manufacturing and Assembly	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Produce an ear mould and shell

SAQA US ID	*UNIT STANDARD TITLE*		
264998	Produce an ear mould and shell		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	14

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Take an impression of an ear.

SPECIFIC OUTCOME 2
Create a negative of the impression.

SPECIFIC OUTCOME 3
Create the mould cavity.

SPECIFIC OUTCOME 4
Cast moulds and shells.

SPECIFIC OUTCOME 5
Inspect castings.

SPECIFIC OUTCOME 6
Finish off moulds and shells.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	67569	National Certificate: Electronics Manufacturing and Assembly	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Complete post-production and finishing operations

SAQA US ID	*UNIT STANDARD TITLE*		
265000	Complete post-production and finishing operations		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	6

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
9878	Complete post-production and finishing operations	Level 2	12	Will occur as soon as 265000 is registered

SPECIFIC OUTCOME 1
Prepare for post-production and finishing activities.

SPECIFIC OUTCOME 2
Apply finishing procedures to product.

SPECIFIC OUTCOME 3
Carry out post-production/assembly operations.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	67569	National Certificate: Electronics Manufacturing and Assembly	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Maintain stock levels of equipment and consumables

SAQA US ID	*UNIT STANDARD TITLE*		
265001	Maintain stock levels of equipment and consumables		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	4

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Explain stock control concepts.

SPECIFIC OUTCOME 2
Maintain appropriate stock levels.

SPECIFIC OUTCOME 3
Procure stock for a given period or specific contract.

SPECIFIC OUTCOME 4
Count and evaluate materials stocked.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	67569	National Certificate: Electronics Manufacturing and Assembly	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Assemble components

SAQA US ID	*UNIT STANDARD TITLE*		
265003	Assemble components		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	12

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
9877	Assemble components	Level 2	12	Will occur as soon as 265003 is registered

SPECIFIC OUTCOME 1
Prepare for work activity.

SPECIFIC OUTCOME 2
Assemble components.

SPECIFIC OUTCOME 3
Perform finishing activities.

SPECIFIC OUTCOME 4
Apply basic quality checks on materials, components and product.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	67569	National Certificate: Electronics Manufacturing and Assembly	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Explain sound and acoustics

SAQA US ID	*UNIT STANDARD TITLE*		
265004	Explain sound and acoustics		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	10

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Explain the anatomy and function of the human ear.

SPECIFIC OUTCOME 2
Explain the concept of sound.

SPECIFIC OUTCOME 3
Explain the transmission of sound in electronic devices.

SPECIFIC OUTCOME 4
Demonstrate knowledge of the operation of electronic sound devices.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	67569	National Certificate: Electronics Manufacturing and Assembly	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Monitor the quality of materials and the manufactured product

SAQA US ID	*UNIT STANDARD TITLE*		
265006	Monitor the quality of materials and the manufactured product		
ORIGINATOR		*PROVIDER*	
SGB Manufacturing and Assembly Processes			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	4

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Describe and explain the concepts of quality.

SPECIFIC OUTCOME 2
Conduct visual checks on incoming materials and components and the manufactured product.

SPECIFIC OUTCOME 3
Measure products, components and materials and conduct tests.

SPECIFIC OUTCOME 4
Record production and defects and report incidents.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	67569	National Certificate: Electronics Manufacturing and Assembly	Level 2