

No. 920

5 September 2008

**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

Generic Manufacturing, Engineering and Technology

registered by Organising Field 06 – Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at www.saq.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 5 October 2008**. All correspondence should be marked **Standards Setting – SGB for Generic Manufacturing, Engineering and Technology** and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. D. Mphuthing
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 – 431-5144
e-mail: dmphuthing@saqa.org.za

DR. S. BHIKHA
DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:**National Certificate: Mechanical Engineering: Machining and Tooling**

SAQA QUAL ID		QUALIFICATION TITLE	
63649		National Certificate: Mechanical Engineering: Machining and Tooling	
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering & Technology			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National Certificate	6 - Manufacturing, Engineering and Technology	Engineering and Related Design	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	132	Level 3	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:**

The purpose of the qualification is to provide learners, education and training providers and employers with the standards and the range of learning required to work effectively in various industries making use of engineering machining skills to meet the challenges of such an environment.

The primary skill that is recognised in this qualification is the ability to produce components of some complexity using a variety of machining methods. This capability requires an understanding of advanced machining theory, detailed engineering drawings and a variety of tests and treatments used on engineering metals. Hand skills play a large role in this qualification.

Qualifying learners will be able to maintain and support the various policies and procedures related to the safety, health, environment and quality systems that govern their workplace.

Qualifying learners at NQF Level 3 will be able to:

- > Produce components using simple machining processes to meet operational and output requirements in accordance with legal, health, safety and environmental requirements.
- > Conduct process control activities to ensure quality control and continuous improvement to comply with specifications.
- > Communicate with peers, customers and members of supervisory/management levels by demonstrating the ability to gather and summarise information from a range of sources and produce coherent presentations in a prescribed format.

Rationale:

The qualification addresses needs as identified in the machining disciplines as part of the mechanical engineering sector to ensure that there is a capacity to meet the growth demand of the sector. The mechanical engineering sector broadly refers to manufacturing plants,

processing plant and other industrial operations, ensuring that production efficiencies, plant and machine availability and quality of output are consistently maintained in support of competitiveness. This occupational qualification serves the need of the society and the economy by providing engineering support services in the manufacture and maintenance of machinery, plant and engineering systems in industries such as:

- > Manufacturing and Engineering (Metals, Plastics, Tyre and Rubber, Automotive Manufacturing, Packaging, Capital equipment, Tooling, Agro-processing).
- > Chemical, Petrochemical, Pharmaceuticals.
- > Mining.
- > Transport (Maritime, Road, Rail and Aviation).
- > Civil Engineering and Construction.
- > Food and Beverages.
- > Defence.
- > Energy (generation, transmission, distribution, maintenance, alternative, renewable, domestic).
- > Other engineering-related industry sectors (health, safety).

The industries within these sectors include specific needs related to amongst others:

- > Design.
- > Industrialisation.
- > Manufacturing.
- > Maintenance.
- > Mechanical engineering related information communication technology.

The range of typical learners at this level could include individuals preparing for occupations or trades as:

- > Turners.
- > Tool, jig, mould and die makers.
- > Machinists.

This mechanical engineering qualification provides the learner with the intermediate skills, knowledge and competencies that are required within the machining environment providing a common set of specialisation skills in Machining, Tool, Die, Mould and Jig Making at NQF Level 3. This leads to further specialisations within each of these categories at a NQF Level 4.

This qualification could assist with the achievement of national governmental and industrial development policies and strategies to grow the pool of scarce and other related skills in support of sustainable economic growth. People working in the engineering machining field require specialized technical skills and knowledge, as well as highly developed hand skills in order to adapt to and meet the requirements of the constantly changing products that must be manufactured. Through its design, this qualification will meet the needs of learners within the mechanical engineering sector who require technical expertise and essential knowledge needed to earn formal qualifications. This qualification facilitates access for previously disadvantaged groups and other learners to acquire the technical knowledge and skills that are required as well as provide access and mobility into higher-level more specialised occupations. This will allow the learner greater employability and support the development of small, medium enterprises (SME).

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED IN PLACE

This qualification assumes learners have a national certificate in engineering NQF Level 2 or equivalent.

If the learner does not already have such a qualification, learning in preparation for this qualification would also have to include:

- > Communication at NQF Level 2.
- > Mathematical literacy at NQF Level 2.
- > Science and technology concepts at or equivalent to NQF Level 2.
- > ID 12466: Explain the individual's role within business NQF Level 2.
- > ID 13220: Keep the work area safe and productive, NQF Level 2.
- > ID 12477: Identify engineering materials, their characteristics and applications and common metal tests used in engineering, NQF Level 2.
- > ID 12215: Read, interpret and produce basic engineering drawings, NQF Level 2.
- > ID 12216: Select, use and care for engineering hand tools, NQF Level 2.
- > ID 12476: Select, use and care for engineering measuring equipment, NQF Level 2.
- > ID 9881: Mark off basic regular engineering shapes, NQF Level 2.
- > ID 12219: Select, use and care for engineering power tools, NQF Level 2.
- > ID 253440: Assemble mechanical components, NQF Level 2.
- > ID 13219: Maintain static seals in machines and/or equipment, NQF Level 2.

Recognition of Prior Learning:

This qualification can be obtained wholly or in part through the recognition of prior learning (RPL). The learner should be thoroughly briefed on the process. Support and guidance should be provided. The process should not be so onerous as to prevent learners from taking up the RPL option in obtaining the qualification.

Access to the Qualification:

- > Open.

QUALIFICATION RULES

The Fundamental Component which are all compulsory consisting of unit standards in:

- > Communications at Level 3 to the value of 20 credits.
- > Mathematical Literacy at Level 3 to the value of 16 credits.

The Core Component consists of Unit Standards to the value of 63 credits all of which are compulsory.

The Elective Component makes provision for specialisations such as tooling, machining, CNC etc. from which a selection of unit standards to the value of 33 credits can be chosen to make up the total of 132 credits to achieve the qualification. These 33 credits could be chosen as clusters of unit standards from Chemical, Tooling, Machining or any other metal or other industries in order to facilitate specialisations or the registration of learning programmes in specialisation areas.

EXIT LEVEL OUTCOMES

On completion of this Qualification learners are able to:

1. Produce components using simple machining processes to meet operational and output requirements in accordance with legal, health, safety and environmental requirements.
 - > Range: Simple machining processes includes Single start Internal/External thread; Internal/external taper; Single taper; Counter balancing on face plate; Simple/indirect/direct/angular indexing; Vertical boring; Pitch drilling.

- > Range: Operational and output requirements include maintenance, manufacturing, planning, customer, management and quality.
- > Note: Produce includes the machining of components for maintenance and/or productions requirements.

2. Conduct process control activities to ensure quality control and continuous improvement to comply with specifications.

3. Communicate with peers, customers and members of supervisory/management levels by demonstrating the ability to gather and summarise information from a range of sources and produce coherent presentations in a prescribed format.

Critical Cross Field Outcomes:

The critical cross-field outcomes are supported by the exit level outcomes as follows:

Identifying and solving problems in which responses display that responsible decisions using critical thinking have been made:

- > Related to the application of mechanical technology and skills.
- > In preparation and during the execution of job activities.
- > Solving familiar maintenance problems.

Working effectively with others as a member of a team, group, organization and community:

- > All tasks and work-related experience are performed within a team environment.
- > Taking into account, the safety of others.
- > Communicating with production, quality control and supervisory personnel and/or clients.

Organising and managing oneself and one's activities responsibly and effectively:

- > Related to planning and preparation of machining and tooling tasks.

Collecting, analyzing, organizing and critically evaluating information:

- > Related to planning and preparation in order to execute job activities.
- > Completion of technical reports related to the job activity.
- > Solve familiar problems related to maintenance tasks at hand.

Communicating effectively using visual, mathematical and/or language skills:

- > During planning, preparation and the execution of job activities Completion of technical reports related to the job activity.
- > Communicating effectively by verbal explanation.
- > Communicating as a part of a team.

Using science and technology effectively and critically, showing responsibility towards the environment and health of others when:

- > Understand and explain machining theory and mathematical and scientific concepts underpinning the machining operation.

Demonstrating an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation when:

- > The relationship of the drawing to the final machined component.
- > The manufacturing purpose of the machined component.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

1.1 A process plan and an operation sheet are developed in accordance with operational procedures.

- > Range: Operational procedures relate to sequencing, equipment, speeds and feeds.

1.2 Detailed engineering drawings are produced and interpreted in order to manufacture a component in accordance with specified requirements.

1.3 Components are produced in accordance with safe working practices reflecting care for fellow workers and the environment.

1.4 Maintenance and house keeping activities are undertaken during the production of components.

- > Range: Maintenance and house keeping activities includes but are not limited to clean machine, component, and tools related to the manufacturing process.

1.5 Components are produced in accordance with output requirements.

- > Range: Output requirements include but are not limited to the process plan, operations sheet and drawing specifications, cost effectiveness, functionality and quality.

Associated Assessment Criteria for Exit Level Outcome 2:

2.1 Inspection methods are selected and applied to determine component compliance with specifications.

2.2 Common problems within a machining environment are solved by using appropriate procedures.

- > Range: Common problems include but are not limited to rough cut, surface finishing, maintaining dimensions, machinery operations, tooling.

2.3 Process adjustment requirements are identified in collaboration with team members.

2.4 Inspection measurement data are produced, evaluated and presented in accordance with recording requirements.

2.5 Process control activities are done within a clearly defined context with some scope for personal decision-making and responsibility.

2.6 Process control activities are undertaken reflecting that the output and quality requirements have been met.

Associated Assessment Criteria for Exit Level Outcome 3:

3.1 Information is gathered from a range of sources and accurately summarised into a prescribed format.

3.2 Information is clear and accurate and presented in a timely manner in the required format to appropriate parties.

3.3 Relationships with peers and supervisory/management levels are established and functioning.

3.4 The process and outcomes of the component manufacturing are discussed to reflect technical and non-technical communication skills.

- > Range: Technical: speeds, feeds, cutter angles, correct materials.

- > Range: Non-technical: discussion with supervisor/manager, fellow workers and peers, participation in meetings, safety and environment.

3.5 The options for further learning in this or a related field of study are discussed to reflect an understanding of further development, specialisations and preparation requirements for such learning.

Integrated Assessment:

- > Assessment practices must be open transparent fair valid and reliable and should ensure that no learner is disadvantaged in any way whatsoever, so that an integrated approach to assessment is incorporated into the qualification.
- > Learning teaching and assessment are inextricably interwoven. Whenever possible the assessment knowledge skills attitudes and values shown in the unit standards should be integrated.
- > Assessment of Communication and Mathematical Literacy should be integrated as far as possible with other aspects and should use practical administration contexts wherever possible. A variety of methods must be used in assessment and tools and activities must be appropriate to the context in which the learner is working or will work. Where it is not possible to assess the learner in the workplace or on-the-job, simulations, case studies, role plays and other similar techniques should be used to provide a context appropriate to the assessment.
- > The term "integrated assessment" implies that theoretical and practical components should be assessed together. During integrated assessments, the assessor should make use of a range of summative assessment methods and assess combinations of practical, applied, foundational and reflective competencies.
- > Assessors must assess and give credit for the evidence of learning that has already been acquired and could include formal, non-formal learning and work experience.
- > Assessment should ensure that all specific outcomes, embedded knowledge and critical cross-field outcomes are evaluated in an integrated manner.
- > Integrated assessment instruments may combine practical and theoretical components of assessment with unit standards in relation to the exit level outcomes.

INTERNATIONAL COMPARABILITY

The National Certificate: Mechanical Engineering NQF Level 2 is the first of a learning path of three consecutive qualifications which culminate in the Further Education and Training Certificate Mechanical Engineering Machining and Tooling NQF Level 4. The international qualifications found, do not lead to three different qualifications, but culminate in one qualification over a four-year period (in most cases).

It is only in the vocational context, that we find the tendency to "break up" the traditional trades into levels of learning. This practice is endemic of those countries which have a close association with outcomes-based methodology and standards-based qualifications development.

The mechanical engineering qualifications (NQF Level 2, NQF Level 3 and NQF Level 4 respectively) collectively compare well to similar apprenticeship and vocational education and training (VET) international qualifications.

In benchmarking the Mechanical Engineering qualifications at Level 2, Level 3 and Level 4, against international qualifications, examples in different parts of the world were investigated for their generic mechanical engineering content (excluding specialised sub-fields):

New Zealand (www.kiwiquals.govt.nz) in terms of the New Zealand Qualifications Framework (NZQF):

- > National Certificate in Engineering (General Engineering - Mechanical) (Level 2) - Competenz (Training Provider).
- > National Certificate in Mechanical Engineering (Level 2) - Competenz (Training Provider).

Australia (www.ntis.gov.au) in terms of the Australian Quality Training Framework (AQTF):

The following information was obtained on the website: <http://www.ntis.gov.au> (National Information Training System) with regards to qualifications in mechanical engineering training streams in Australia.

"Australian Apprenticeships" is the new name for the scheme formerly known as 'New Apprenticeships'.

Australian Apprenticeships encompass all apprenticeships and traineeships. They combine time at work with training and can be full-time, part-time or school-based.

The change of name and appearance is the first step in a range of improvements to be introduced in Australian Apprenticeships. The qualifications for machining and tooling cover:

- > Certificate I and II Engineering: Mechanical Trade.
- > Certificate II in Production Technology.
- > Certificate III Mechanical Engineering and Technical.
- > Certificate IV Mechanical Engineering.

United Kingdom (England and Scotland) - from www.ecitb.org.uk:

The qualification from the National and Scottish Vocational Qualifications (N/SVQ) which relates to standards-based programme is the N/SVQ Maintaining Plant and Systems - Mechanical. This programme is the closest programme related to the Machining and Tooling NQF Level 2 - 4. It comprises:

- > Maintaining Plant & Systems Mechanical N/SVQ - Mandatory Units.
- > Maintaining Plant & Systems Mechanical N/SVQ - Technical Options Set A.
- > Maintaining Plant & Systems Mechanical N/SVQ - Technical Options Set B.

African Comparability:

Southern African Development Community (SADC) - Zimbabwe and Botswana:

Alignment with the United Kingdom's model of Vocational Education and Training (VET), through the London City and Guilds qualification framework and the National Vocational Qualification system (NVQ)-The Botswana National Qualifications Act was passed in 1998. At this present time, focus on the development of standards-based qualifications through a Botswana Vocation Education and Training System (BVET) has revolved around the Wholesale and Retail and Tourism sectors.

Currently, machinists in Botswana are trained through the apprenticeship system. The length and duration of the practical and theoretical components differ slightly to the South African apprenticeship system, but the learning competencies are similar, with a focus on the predominant diamond mining and small local manufacturing and engineering industries.

East African Community (EAC):

The three member states of the EAC; Kenya, Tanzania and Uganda, are in the process of the harmonisation of education and training systems within the EAC. Currently, no qualification infrastructure exists.

Canada:

Information regarding training was also found on the website of the British Columbia Institute of Technology (www.bcit.ca), the College of The Rockies (www.cotr.bc.ca) and North Alberta Institute of Technology (www.nait.ca). The full machinists qualification is obtained over a four-year period. The "job description" of the machinists is in essence similar in the international arena. Machinists produce, repair and maintain all types of machinery and tools".

Conclusion: The Canadian qualifications related to machining can be used interchangeably with the qualifications developed for the South African manufacturing and engineering industries, serving a similar purpose.

United States:

In the United States model, the machining qualification is achieved over a four-year period and is similar to the traditional apprenticeship system in South Africa. The methodology is competency-based as opposed to outcomes-based.

The programme content however, is similar to the broad context of Mechanical Engineering Machining and Tooling Levels 2, 3 and 4.

Conclusion: The reviewed machining and tooling qualifications NQF Level 2, NQF Level 3 and NQF Level 4 are in line with the US example for year 1/2 of the apprenticeship programme.

> This type of work requires many different skills. Machinists need to understand how machines work, be able to follow drawings and blueprints, use precision assembly equipment, and calculate angles and measurement.

> They also need to know how to use power tools, cutting torches and demonstrate the ability to weld using a variety of welding processes.

Comparisons with National Certificate Mechanical Engineering NQF Level 2, NQF Level 3 and NQF Level 4.

The National Certificate Mechanical Engineering qualifications compares well to all the qualifications investigated with an overarching comparison covering:

> Content:

The qualifications from the various countries all address the range of mechanical competencies included in NQF Level 2, NQF Level 3 and NQF Level 4.

> Progression:

The international qualifications all address a progression of competencies, e.g. Introduction to mechanical engineering technology and process and the demonstration of the ability to assemble, remove and replace components. The content of the first/second year/level of the machining and tooling qualifications across the globe, relates favourably to the content of Mechanical Engineering qualifications and the learning assumed to be in place:

Demonstrate Work Practices:

> Basic training and skills in mechanical engineering technology processes and application of those skills to problems or demonstrate industrial electronic ability.

> Practice safe work habits.

> Apply that mechanical knowledge and skills and assist maintenance and/or production teams:

> Explain federal/provincial/state/territory's occupational health and safety regulations.

> Explain environmental regulations.

> Use personal protective equipment.

> Maintain safe working area.

> Describe fire prevention and control.

> Identify ergonomic considerations.

> Use communication and team skills.

> Interpret plans and sketches.

- > Use references resources.
- > Describe trade science.
- > Use trade math:
 - > Describe principles of metallurgy.
 - > Use fasteners.
 - > Use hand tools.
 - > Use measuring and layout tools and instruments.
 - > Use power tools.
 - > Use fixed shop machines and equipment.
 - > Use mobile equipment.
- > Conclusion: These outcomes are covered within the qualifications developed for South Africa.
- > Learning delivery: The learning delivery process in all the examples included on-the-job (practical) and off-the-job (theoretical) components.
- > Outcomes-Based: All the examples found either directly or indirectly comply with principles of outcomes-based learning, particularly in terms of outcomes representing meaningful units of learning and assessment being conducted continuously (formatively). There is generally a final integrated assessment, typically called a trade test, where the candidate is required to demonstrate specific and core (cross-field) knowledge and skills.
- > Apprenticeships and VET programmes: In all the examples found, learning is vocational-based. In some countries (England, Scotland, New Zealand and Australia) these are called "modern apprenticeships". These take the form of two categories, namely a programme-led apprenticeship where learners are able to follow a vocational programme at a college and then seek employment as trainees/apprentice/interns in order to qualify as artisans; and an employer-led apprenticeship, in which learners are engaged in a formal contract of learning and most learning is workplace-based. In most cases learners "earn while they learn".
- > Application (Purpose): As is the intention with the South African qualifications, the international qualifications all prepare learners for working in process or manufacturing oriented industries where they contribute to the effective and efficient maintenance/ production of plant and equipment.
- > Status: In all countries researched, engineering apprenticeship numbers have declined thus making "mechanical fitters" sought after individuals and their skills highly rated.

Concluding remarks:

The outcomes of the Mechanical Engineering: Machining and Tooling certificates at NQF Level 2, NQF Level 3 and NQF Level 4 developed for South Africa compares favourably with the rest of the international community and by every indication, is compatible with those countries who engage with outcomes-and standards-based qualifications.

ARTICULATION OPTIONS

The qualification was designed to enable qualifying learners to move from one engineering context to another and still get recognition for successful learning achievements in the previous context. This means that credit accumulation towards certification could be obtained across industries.

Vertical articulation:

- > ID 23279: Further Education and Training Certificate: Mechanical Engineering: Machining NQF Level 4.
- > ID 57885: Further Education and Training Certificate: CNC Production Machining.

> ID 63629: Further Education and Training Certificate: Mechanical Engineering: Fitting NQF Level 4.

Horizontal articulation:

> Fundamental learning at this level applies to equivalent credit accrual for engineering-related qualifications at NQF Level 3.

Core learning at this level applies to equivalent credit accrual for some unit standards in the following qualifications:

- > ID 22423: National Certificate: Engineering and Related Design NQF Level 3.
- > ID 58720: National Certificate: Engineering Fabrication NQF Level 3.
- > ID 59669: National Certificate: Mechanical Engineering: Fitting NQF Level 3.
- > ID 57886: National Certificate: Welding Application and Practice NQF Level 3.

Other horizontal articulation options may exist and need further investigation in cases where recognition of prior learning is sought.

MODERATION OPTIONS

> Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered with an appropriate Education and Training Quality Assurance Body (ETQA) or with an ETQA which has a Memorandum of Understanding (MOU) with the relevant ETQA.

> Any institution offering learning that will enable the achievement of this qualification must be accredited as a Training Provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding (MOU) with the relevant ETQA.

> Moderation of assessment will be overseen by the relevant ETQA or by an ETQA that has a Memorandum of Understanding (MOU) with the relevant ETQA according to that ETQA's guidelines for assessment and moderation.

> Moderation, includes both internal and external moderation of assessment/s at the exit points of the qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual unit standards as well as in exit level outcomes described in this Qualification.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

The following criteria should be applied by a relevant ETQA as a minimum requirement:

> Assessors should be in possession of an appropriate qualification:

> Mechanical Engineering in the specific discipline at NQF Level 4 and a minimum period of 5 years related experience as specified by the relevant ETQA.

Or

> An artisan qualification in Mechanical Engineering in the specific discipline (Trade test certificate or completed contract of apprenticeship) with a minimum of 5 years of related experience as specified by the relevant ETQA.

Or

> Subject matter experience, which may be established through recognition of prior learning (RPL).

> Registration as an assessor with the relevant Education and Training Quality Assurance Body.

> Proven inter-personal skills and the ability to:

> Maintain national and local industry standards.

- > Act in the interest of the learner.
- > Understand the need for transformation to redress the legacies of the past, and respect the cultural background and language of the learner.

NOTES

Completion of this qualification relates to the Organising Framework for Occupations (OFO) in that it reflects the competencies of occupational designation 711 Machine Operator.

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamental	9013	Describe, apply, analyse and calculate shape and motion in 2-and 3-dimensional space in different contexts	Level 3	4
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	9012	Investigate life and work related problems using data and probabilities	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial aspects of personal, business and national issues	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Core	9526	Manage basic business finance	Level 3	6
Core	9530	Manage work time effectively	Level 3	3
Core	258716	Produce components by performing engineering grinding operations	Level 3	12
Core	258718	Produce components by performing milling operations	Level 3	16
Core	258717	Produce components by performing turning operations	Level 3	20
Core	13298	Produce detailed engineering drawings	Level 3	6
Elective	115091	Monitor compliance to safety, health and environmental requirements in a workplace	Level 2	2
Elective	244611	Apply problem-solving techniques to make a decision or solve a problem in a real life context	Level 3	2
Elective	13234	Apply quality procedures	Level 3	8
Elective	12488	Complete feasibility and commissioning reports	Level 3	3
Elective	12457	Develop learning strategies and techniques	Level 3	3
Elective	14688	Develop work instructions for thermoplastic fabrication using drawings	Level 3	10
Elective	12456	Explain and use organisational procedures	Level 3	6
Elective	116218	Explain the planning and scheduling of tasks in a production environment	Level 3	3
Elective	258722	Maintain and repair production tooling	Level 3	16
Elective	258723	Manufacture production tooling to drawing or sample part	Level 3	24
Elective	243025	Monitor machining process, interpret statistical process control charts, and rectify production problems	Level 3	7
Elective	8039	Operating cranes	Level 3	10
Elective	8038	Operating lift trucks	Level 3	6
Elective	13275	Perform heat treatment processes on engineering metals	Level 3	8
Elective	13260	Perform non-destructive tests on metal parts and components	Level 3	6
Elective	117877	Perform one-to-one training on the job	Level 3	4
Elective	258715	Produce components by spark eroding machining operations	Level 3	8
Elective	120383	Provide assistance in implementing and assuring project work meets quality requirements	Level 3	6
Elective	243024	Set up and start CNC machining processes	Level 3	14
Elective	13274	Test the physical properties of engineering metals	Level 3	4
Elective	114978	Use a word processing package to produce business documents	Level 3	3
Elective	119169	Work with and look after materials in the plastics manufacturing production process	Level 3	12

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION***None***



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Produce components by spark eroding machining operations***

SAQA US ID	UNIT STANDARD TITLE		
258715	Produce components by spark eroding machining operations		
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering& Technology			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	8

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13255	Produce components by spark eroding machining operations	Level 3	8	Will occur as soon as 258715 is registered

SPECIFIC OUTCOME 1

Plan and prepare spark eroding machine.

SPECIFIC OUTCOME 2

Machine electrode.

SPECIFIC OUTCOME 3

Perform spark eroding operations.

SPECIFIC OUTCOME 4

Apply quality checks on component.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63649	National Certificate: Mechanical Engineering: Machining and Tooling	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Produce components by performing engineering grinding operations***

SAQA US ID	UNIT STANDARD TITLE		
258716	Produce components by performing engineering grinding operations		
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering& Technology			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	12

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13294	Produce components by performing engineering grinding operations	Level 3	12	Will occur as soon as 258716 is registered

SPECIFIC OUTCOME 1

Explain and discuss surface grinding processes.

SPECIFIC OUTCOME 2

Grind work piece square.

SPECIFIC OUTCOME 3

Grind angles.

SPECIFIC OUTCOME 4

Grind component on cylindrical grinding machine.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63649	National Certificate: Mechanical Engineering: Machining and Tooling	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Produce components by performing turning operations***

SAQA US ID		UNIT STANDARD TITLE	
258717		Produce components by performing turning operations	
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering & Technology			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	20

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13295	Produce components by performing engineering turning operations	Level 3	20	Will occur as soon as 258717 is registered

SPECIFIC OUTCOME 1

Explain and discuss turning operations.

SPECIFIC OUTCOME 2

Prepare for turning operations and maintain lathe.

SPECIFIC OUTCOME 3

Perform turning operations.

SPECIFIC OUTCOME 4

Finish turning operation.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63649	National Certificate: Mechanical Engineering: Machining and Tooling	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Produce components by performing milling operations***

SAQA US ID		UNIT STANDARD TITLE	
258718		Produce components by performing milling operations	
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering & Technology			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	16

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13296	Produce components by performing engineering milling operations	Level 3	20	Will occur as soon as 258718 is registered

SPECIFIC OUTCOME 1

Explain and discuss milling operations.

SPECIFIC OUTCOME 2

Prepare for milling operations and maintain milling machine.

SPECIFIC OUTCOME 3

Perform milling operations.

SPECIFIC OUTCOME 4

Finish milling operation.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63649	National Certificate: Mechanical Engineering: Machining and Tooling	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Maintain and repair production tooling***

SAQA US ID		UNIT STANDARD TITLE	
258722		Maintain and repair production tooling	
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering & Technology			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Manufacturing and Assembly	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	16

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13257	Maintain and repair production tooling	Level 3	20	Will occur as soon as 258722 is registered

SPECIFIC OUTCOME 1

Discuss and explain the procedures in the maintenance and repair of production tooling.

SPECIFIC OUTCOME 2

Dismantle tooling components.

SPECIFIC OUTCOME 3

Identify and analyse defects in tooling.

SPECIFIC OUTCOME 4

Manufacture/repair tooling components in accordance with legal and safety requirements.

SPECIFIC OUTCOME 5

Conduct sample try-out.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63649	National Certificate: Mechanical Engineering: Machining and Tooling	Level 3



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Manufacture production tooling to drawing or sample part

SAQA US ID	UNIT STANDARD TITLE		
258723	Manufacture production tooling to drawing or sample part		
ORIGINATOR	PROVIDER		
SGB Generic Manufacturing, Engineering & Technology			
FIELD	SUBFIELD		
6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly		
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	24

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13259	Manufacture production tooling to drawing or sample part	Level 3	36	Will occur as soon as 258723 is registered

SPECIFIC OUTCOME 1

Plan and prepare for tooling manufacturing process.

SPECIFIC OUTCOME 2

Manufacture production tooling.

SPECIFIC OUTCOME 3

Test tool in accordance to drawing specifications.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	63649	National Certificate: Mechanical Engineering: Machining and Tooling	Level 3