

No. 919

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.saqqa.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:

Further Education and Training Certificate: Mechanical Engineering: Machining and Tooling

SAQA QUAL ID	QUALIFICATION TITLE		
63629	Further Education and Training Certificate: Mechanical Engineering: Machining and Tooling		
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering & Technology			
QUALIFICATION TYPE	FIELD	SUBFIELD	
Further Ed and Training Cert	6 - Manufacturing, Engineering and Technology	Engineering and Related Design	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	132	Level 4	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 also be able to relate what they are doing to scientific and technological principles and concepts. They will also 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 4 will be able to:

- > Produce components using complex machining processes to meet operational and output requirements using a variety of machining methods, machines and operations in accordance with legal, health, safety and environmental requirements.
- > Apply and sustain quality specifications to meet output requirements in producing complex components.
- > Maintain and support procedures to fault-find and solve a variety of familiar and unfamiliar machining problems, taking responsibility and making decisions.
- > Analyse and communicate information to identify problems and determine trends.

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 to qualify in occupations or trades such 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 mechanical engineering Machining at NQF Level 3 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 3.
- > Mathematical literacy at NQF Level 3.
- > Science and technology concepts at or equivalent to NQF Level 3.
- > Produce components by performing engineering grinding operations at NQF Level 3.
- > Produce components by performing engineering milling operations at NQF Level 3.
- > Produce components by performing engineering turning operations at NQF Level 3.
- > Produce detailed engineering drawings at NQF Level 3.

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

Fundamental Component:

The Fundamental Component consists of unit standards in:

- > Communications at NQF Level 4 to the value of 20 credits.
- > Communications at NQF Level 3 to the value of 20 credits.
- > Mathematical Literacy at NQF Level 4 to the value of 16 credits.

All Unit Standards to the value of 56 credits in the Fundamental Component are compulsory.

Core Component:

The Core Component consists of Unit Standards to the value of 56 credits, all of which are compulsory.

Elective Component:

The Elective Component consists of a number of unit standards that can be utilized for various specialization areas. Learners are to choose Elective Unit Standards to the value of 20 credits from the Elective Unit standards so as to attain a minimum of 132 credits for this qualification.

These 20 credits could be chosen as clusters of unit standards from Chemical, Tooling, Metrology, CNC, 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 complex machining processes to meet operational and output requirements using a variety of machining methods, machines and operations in accordance with legal, health, safety and environmental requirements.
 - > Range: Complex machining processes includes Internal taper; Multi start thread; Matching tapers; Differential indexing (gear cutting); Rack and pinion; Spline shaft; Spurr gear; Step boring (vertical and horizontal), machine tapping and reaming.
 - > 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. Apply and sustain quality specifications to meet output requirements in producing complex components.
 - > Range: Quality specifications include quantity, time, tolerance, cost effectiveness, functionality.
3. Fault-find and solve a variety of familiar and unfamiliar machining problems, taking responsibility and making decisions.
4. Analyse and communicate information to identify problems and determine trends.

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 fitting 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 purpose and uses of the machined component.

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

- 1.1 Components are machined according to specifications and machining requirements.
- 1.2 Complex components are produced according to the process plan and operation sheet.
- 1.3 Decisions are made on machining process requirements for a specific machining operation.
 - > Range: Machining process requirements include methods, machines, equipment.
- 1.4 Components are machined according to specifications in terms of health, safety and environmental requirements.
- 1.5 Machining methods, machines and operations related to complex machining processes are explained to reflect their impact on operational and output requirements.

Associated Assessment Criteria for Exit Level Outcome 2:

- 2.1 Quality specifications and the principles underpinning such specifications are interpreted to sustain maintenance and output requirements.
- 2.2 Quality specifications are applied in order to produce complex components.
- 2.3 Inspection methods are utilised in order to evaluate component compliance with specifications.
- 2.4 Inspection data are interpreted in order to adjust machining processes.
 - > Range: Inspection data include finishing, temperature, type of coolant, speed, feed, size, equipment.
- 2.5 Quality specifications related to complex machining processes are explained to reflect their impact on producing complex components.

Associated Assessment Criteria for Exit Level Outcome 3:

- 3.1 Familiar problems are solved by using the specified procedures within a machining environment.
 - > Range: Familiar problems include but are not limited to rough cut, surface finishing, maintaining dimensions, machinery operations, tooling.
- 3.2 Solutions to familiar and unfamiliar machining problems are based on a clear analysis of information gathered through diagnostic procedures.
- 3.3 Machining procedures are adjusted to respond to unfamiliar problems.
- 3.4 Issues related to familiar and unfamiliar problems are discussed to reflect their impact on the machining of complex components.
- 3.5 All actions related to problem solving are reported and recorded for future reference in accordance with organisational procedures.

Associated Assessment Criteria for Exit Level Outcome 4:

- 4.1 Machined component compliance is determined and reported to communicate information on machining processes and results.
- 4.2 Conditions, evidence and incidences are reported accurately in a timely manner and discussed with peers and management.
- 4.3 Data gathered through diagnostic procedures is analysed systematically to solve problems.
- 4.4 Records are kept for scrutiny and future reference in accordance with organisational procedures.
- 4.5 Communication and information analysis requirements are explained to reflect their impact on the need to determine trends.

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 the unit standards in relation to the exit level outcomes.

INTERNATIONAL COMPARABILITY

The National Certificate: Mechanical Engineering at NQF Level 2 is the first of a learning path of three consecutive qualifications which culminate in the FETC Mechanical Engineering Machining and Tooling at 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 at (NQF Level 2, 3 and 4 respectively) collectively compare well to similar apprenticeship and vocational education and training (VET) international qualifications.

In benchmarking the Mechanical Engineering qualifications at NQF Level 2, 3 and 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.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 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 at NQF Level 2, 3 and 4.

Conclusion: The reviewed machining and tooling qualifications at NQF Level 2, 3 and 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 at NQF Level 2, 3 and 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 at NQF Level 2, 3 and 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, 3 and 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**Vertical articulation:**

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.

Horizontal articulation:

This qualification articulates horizontally with any NQF Level 5 qualification in the broad mechanical, engineering related sectors such as:

- > Metal.
- > Tyre.
- > Auto.
- > Motor.
- > Plastics.
- > Foodbev.
- > Mining.
- > Chemical.
- > Transport.

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 a qualification (or equivalent) in the specific mechanical engineering related discipline and at least 5 years experience in the relevant subject area.
- > 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 323204 Metal Machinist (First Class) (Skill level 3).

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Fundamental	9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	6
Fundamental	119462	Engage in sustained oral/signed communication and evaluate spoken/signed texts	Level 4	5
Fundamental	119469	Read/view, analyse and respond to a variety of texts	Level 4	5
Fundamental	9016	Represent analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 4	4
Fundamental	119471	Use language and communication in occupational learning programmes	Level 4	5
Fundamental	7468	Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	6
Fundamental	119459	Write/present/sign for a wide range of contexts	Level 4	5
Core	258680	Conduct advanced milling operations and methods	Level 4	16
Core	258677	Conduct complex turning operations	Level 4	16
Core	258676	Grind tools and cutters used in engineering machining operations	Level 4	8
Core	258675	Produce complex components by performing internal and external grinding operations	Level 4	16
Elective	12429	Develop a personal financial plan	Level 3	2
Elective	9506	Communicate in an assertive manner with clients and fellow workers	Level 4	4
Elective	13254	Contribute to the implementation and maintenance of business processes	Level 4	10
Elective	14586	Monitor and control quality control practices in a manufacturing/engineering environment	Level 4	8
Elective	13301	Produce complex engineering drawings	Level 4	6
Elective	13318	Produce components by performing horizontal boring operations	Level 4	12
Elective	13319	Produce components by performing vertical boring operations	Level 4	8
Elective	13320	Set automatic production lathes	Level 4	10
Elective	116389	Write a technical report	Level 4	4
Elective	13315	Write simple computer numerical controlled (CNC) programmes and set and operate a CNC machine	Level 4	24
Elective	12458	Develop the skills of a work team	Level 5	10

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION

None



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Produce complex components by performing internal and external grinding operations

SAQA US ID	UNIT STANDARD TITLE		
258675	Produce complex components by performing internal and external 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 4	16

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13317	Produce complex components by performing internal and external grinding operations	Level 4	12	Will occur as soon as 258675 is registered

SPECIFIC OUTCOME 1

Conduct pre operational checks on grinding machine.

SPECIFIC OUTCOME 2

Plan and prepare cylindrical grinding machine.

SPECIFIC OUTCOME 3

Perform external and internal cylindrical grinding operations.

SPECIFIC OUTCOME 4

Apply quality checks on components.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63629	Further Education and Training Certificate: Mechanical Engineering: Machining and Tooling	Level 4



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Grind tools and cutters used in engineering machining operations***

SAQA US ID	UNIT STANDARD TITLE		
258676	Grind tools and cutters used in engineering 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 4	8

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13316	Grind tools and cutters used in engineering machining operations	Level 4	8	Will occur as soon as 258676 is registered

SPECIFIC OUTCOME 1

Prepare and set machine for grinding activity.

SPECIFIC OUTCOME 2

Perform tool and cutter grinding operations.

SPECIFIC OUTCOME 3

Apply quality checks on machined tool/cutter.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63629	Further Education and Training Certificate: Mechanical Engineering: Machining and Tooling	Level 4



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:**Conduct complex turning operations**

SAQA US ID	UNIT STANDARD TITLE		
258677	Conduct complex 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 4	16

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13314	Produce complex components using lathes	Level 4	20	Will occur as soon as 258677 is registered

SPECIFIC OUTCOME 1

Plan and prepare for complex turning operation.

SPECIFIC OUTCOME 2

Machine internal and external tapers (matching).

SPECIFIC OUTCOME 3

Use accessories for machine tapping and reaming.

SPECIFIC OUTCOME 4

Calculate and machine multi start thread.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63629	Further Education and Training Certificate: Mechanical Engineering: Machining and Tooling	Level 4



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Conduct advanced milling operations and methods***

SAQA US ID		UNIT STANDARD TITLE	
258680		Conduct advanced milling operations and methods	
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 4	16

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
13305	Produce complex components using milling machines	Level 4	29	Will occur as soon as 258680 is registered

SPECIFIC OUTCOME 1

Plan and prepare to utilise advanced milling operations and methods.

SPECIFIC OUTCOME 2

Cut gears.

SPECIFIC OUTCOME 3

Conduct co-ordinated drilling and boring.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	63629	Further Education and Training Certificate: Mechanical Engineering: Machining and Tooling	Level 4