Title	**Plan and sequence machining operations to maximise production efficiency**		
Level	**4**	**Credits**	**10**

Purpose	This unit standard is for mechanical engineering tradespeople who set up automated milling, turning, and grinding machines to manufacture one, or a series of components. People accredited with this unit standards are able to: demonstrate knowledge of cutting tools and grinding wheels, used in automated production machines, and plan and sequence machine operations for a specified component machining job.

Classification	Mechanical Engineering > Engineering Machining and Toolmaking

Available grade	Achieved

Guidance information

1 Information
This unit standard covers knowledge of automated machining and grinding that needs to be applied when setting up machines to maximise efficiency in the production of components. The knowledge may be applied to production runs and/or one-off jobs.

2 References
Legislation relevant to this unit standard includes but is not limited to the Health and Safety at Work Act 2015.

3 Definitions
Component material refers to the material the component is to be made from
Tooling material is the material the cutting or grinding tool is made from.

4 Assessment information
This unit standard is intended to be delivered and assessed off job through a training provider.

Outcomes and Performance criteria

Outcome 1

Demonstrate knowledge of cutting tools used in automated production machines.

Range turning machines, milling machines

Performance criteria

1.1 Terminology relating to cutting tool geometry is explained.

Range wedge angle, orthogonal cutting, inclined cutting, normal rake, right and left hand cutting, plunge cutting, nose radius, clearance angle, positive rake, negative rake.

1.2 The function of chip breakers is explained in terms of cutting tool operation.

1.3 Cutting inserts are explained in terms of size, geometry, grades, material specifications, hardness, coatings, clamping methods, and ISO standards.

1.4 Factors affecting the selection of a cutting insert for a specific job are listed and explained.

Range may include but is not limited to – component material, component shape, depth of cut, material removal rate, required finish, nose radius, coating, machine power, tool life, tool failure, safety.

1.5 Dry cutting and wet cutting are explained in terms of their application, advantages and disadvantages.

1.6 Common tool failures and associated remedies are identified and explained.

Outcome 2

Demonstrate knowledge of grinding wheels used in automated production machines.

Performance criteria

2.1 Terminology relating to grinding wheels is explained.

Range grit material, grit size, pore size, bond material, grade, shape.

2.2 Abrasive materials are explained in terms of their characteristics and use.

2.3 The factors to be considered when selecting a grinding wheel for a specific job are listed and described.

2.4 The ISO standard marking system for grinding wheels is explained.

2.5 Grinding wheels are selected for specified grinding operations using the ISO grinding wheel marking system.

Range four different specified grinding operations.

2.6 Common grinding wheel failures and associated remedies are identified and explained.

Outcome 3

Plan and sequence machine operations for a specified component machining job.

Range specified machining job must include the following component characteristics – change in component diameter; o-ring groove; bevelled edge, a round machined face, internal radius, drilled hole, internal bore.

Performance criteria

3.1 Component specification is interpreted and critical information relating to final component is obtained.

Range critical information may include but is not limited to: materials, shape, dimensions, angles, tolerances, quality, hardness, surface finish.

3.2 Machining operations to produce the desired component specifications and production outcomes are determined.

Range machining processes – grinding, cutting.

3.3 Feeds and speeds are determined appropriate to the component material and tooling.

3.4 Machine characteristics, to carry out required machining operations, are determined. A machine with the required characteristics is identified and selected.

Range machine characteristics may include but are not limited to – required power, holding and clamping devices for work piece and tooling, finished component and waste removal.

3.5 Machining tool characteristics to produce the desired production outcomes are established.

Range characteristics may include but are not limited to – tool shape and material; grinding wheel shape and material.

3.6 Options for machining step sequence are considered, and most efficient sequence is determined.

Range order of machining operations, machine movement, tool to work clearance, material handling, ergonomics of environment.

3.7 Machining operations and sequence determined will suit the machine tool used and achieve required production efficiency without compromising tool life or safety.

3.8 Machining operations and sequence determined will enable component(s) to meet quality specifications.

Planned review date	31 December 2022

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	1 March 2018	N/A

Consent and Moderation Requirements (CMR) reference	0013

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.