Title	**Demonstrate knowledge of machining equipment, tools, and principles**		
Level	**2**	**Credits**	**3**

Purpose	This unit standard is for people working in the mechanical engineering trades involved in the operation of machines to produce or modify components. People credited with this unit standard are able to demonstrate knowledge of: machines and machine components; machining principles; cutting tools; and cutting speed and feed rates.

Classification	Mechanical Engineering > Engineering Core Skills

Available grade	Achieved

Explanatory notes

1 References
R. Culley (2010) *Fitting and Machining*. Melbourne, Australia, RMIT Publishing. ISBN 9781921426780.

2 Definitions
Accepted industry practice refers to approved codes of practice and standardised procedures accepted by the wider mechanical engineering industry sectors as examples of best practice.
Workplace procedures refer to procedures used by the organisation carrying out the work and applicable to the tasks being carried out. They may include but are not limited to – standard operating procedures, safety procedures, equipment operating procedures, codes of practice, quality management practices and standards, procedures to comply with legislative and local body requirements.

3 Range
Machines – drill press, manually controlled lathe, manually controlled milling machine.

4 Assessment information
Examples/evidence given must be within the context of mechanical engineering and must meet applicable workplace procedures and accepted industry practice.

Outcomes and evidence requirements

Outcome 1

Demonstrate knowledge of machines and machine components.

Evidence requirements

1.1 Machines are identified and their principles of operation are stated.

Range principles of operation include but are not limited to – power supply, rotation of cutting tool or workpiece, holding of workpiece and cutting tool, basic controls.

1.2 Machine components are identified and their function is explained.

Range components that are essential to the safe and effective operation of the equipment.

1.3 Workpiece holding devices for machines are identified and their functions are outlined with reference to application and safety.

Outcome 2

Demonstrate knowledge of machining principles.

Evidence requirements

2.1 The principles of cutting metal using machines are explained.

Range reference to – cutting speed, feed speed, material hardness, cutting fluids.

2.2 The functions of coolant in machining operations are described.

Range cooling, lubricating, chip removing, preventing corrosion.

2.3 The advantages of using computer numerically controlled machines and manually controlled machines are stated.

Outcome 3

Demonstrate knowledge of cutting tools.

Evidence requirements

3.1 Different types of drills and cutting and milling tools are identified and an example given of the use of each.

Range tools include – taper, straight and reduced shank twist drill; centre drill; right and left hand turning tool; slotting cutter; plain milling cutter; side face cutter; single and double angle cutters.

3.2 Wedge angle is described and the relationship between wedge angle and hardness of material is stated.

3.3 The meanings of positive rake, negative rake, and clearance are explained in terms of tool geometry.

3.4 The purpose of chip breakers is explained in terms of cutting tool operation.

3.5 The effects material hardness, tool hardness, speed rate, and feed rate have on tool life is stated.

3.6 Features of a twist drill are identified.

Range features include – rake, lip clearance, point angle, flute, web; drill may be real or a representation of a drill.

Outcome 4

Demonstrate knowledge of cutting speed and feed rates.

Evidence requirements

4.1 The terms cutting speed and feed rate are defined.

4.2 The factors affecting cutting speed and feed rates are described.

4.3 Optimum cutting speed and feed rates are determined for given materials and diameters using nomograms or tables.

Range evidence is required of a minimum of two different materials with a minimum of three different diameters for each material.

Replacement information	This unit standard and unit standard 29673 replaced unit standard 21906.

Planned review date	31 December 2021

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	8 December 2016	N/A

Consent and Moderation Requirements (CMR) reference	0013

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

Please note
Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

Comments on this unit standard

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