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| **Title** | **Apply advanced manual machining techniques in mechanical engineering** | | |
| **Level** | **4** | **Credits** | **15** |

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| **Purpose** | This unit standard is intended for people training to be machining tradespersons in mechanical engineering trades.<br><br>People accredited with this unit standard are able to apply: advanced manual turning techniques, advanced manual milling techniques, and advanced manual grinding techniques. |

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| **Classification** | Mechanical Engineering > Engineering Machining and Toolmaking |

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| **Available grade** | Achieved |

**Guidance Information**

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

2 Definitions
*Advanced* – refers to techniques requiring complex skills and knowledge to produce non-standard metal components using machines manually.
*Accepted industry practice* – approved codes of practice and standardised procedures accepted by the wider mechanical engineering industry sectors as examples of best practice.
*Workplace procedures* – procedures used by the organisation carrying out the work and applicable to the tasks being carried out. Examples are – 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.
*Manual machining* – for this unit standard refers to machining operations on a conventional machine with the operator manually operating hand wheels and cranks.

3 Recommended units for entry:
Unit 2712, *Produce components by performing engineering grinding operations*;
Unit 2714, *Produce components by performing engineering turning operations*;
Unit 2715, *Produce components by performing engineering milling operations*.

4 Assessment information
All activities must be consistent with accepted industry practice and comply with workplace procedures. Components to be produced using these techniques must be

defined by technical drawings or specifications and the components produced must meet the specifications defined.

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

## Outcomes and performance criteria

### Outcome 1

Apply advanced manual turning techniques.

Range screw cutting internal and external multi start threads, screw cutting internal and external left hand threads, form turning, eccentric turning, parallel and taper turning between centres using the offset tailstock method, counter balancing a face plate and a four jaw chuck, use of fixed and travelling steadies; turning tolerances – length ±0.05mm; diameter ±0.03mm; maximum total dial test indicator runout 0.020mm.

### Performance criteria

1.1 Drawing or specification is interpreted and critical information required for manual turning is obtained.

1.2 Equipment, machine, and tooling are selected and set up to meet the job requirements.

1.3 Turning operations are completed.

1.4 Measuring equipment appropriate for the required accuracy is selected and used to confirm that specifications have been achieved.

1.5 Machine and equipment are left in a condition ready for the next operation.

### Outcome 2

Apply advanced manual milling techniques.

Range helical milling using dividing head gear trains, use of boring heads, gang milling and straddle milling using a horizontal arbor, cutting a T slot, cutting a dovetail, use of a rotary table, cutting spur gears; milling tolerances – ±0.03mm, maximum total dial test indicator runout 0.020mm.

### Performance criteria

2.1 Drawing or specification is interpreted and critical information required for manual milling is obtained.

2.2 Equipment, machine, and tooling are selected and set up to meet the job requirements.

2.3 Milling operations are completed.

2.4 Measuring equipment appropriate for the required accuracy is selected and used to confirm that specifications have been achieved.

2.5 Machine and equipment are left in a condition ready for the next operation.

**Outcome 3**

Apply advanced manual grinding techniques using surface and cylindrical grinders.

Range production of a square shoulder on a flat plane, production of a tapering flat plane, production of an internal diameter with shoulder, production of an external diameter with shoulder, dressing and balancing a grinding wheel, shaping a grinding wheel, use of magnetic blocks;
grinding tolerances for all geometric aspects – ±0.010mm unless specified.

**Performance criteria**

3.1 Drawing or specification is interpreted and critical information required for manual grinding is obtained.

3.2 Equipment, machine, and grinding wheel are selected and set up to meet the job requirements.

Range grinding machine, grinding wheel, wheel mounting, work holding devices.

3.3 Grinding operations are completed.

3.4 Measuring equipment appropriate for the required accuracy is selected and used to confirm that specifications have been achieved.

3.5 Machine and equipment are left in a condition ready for the next operation.

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| **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 |
| Revision | 2 | 28 March 2019 | N/A |

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| **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.