



National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard Technology Level 3

This exemplar supports assessment against:

Achievement Standard 91625

Demonstrate understanding of a complex machine

An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. It assists teachers to make assessment judgements at the grade boundaries.

New Zealand Qualifications Authority

To support internal assessment

	Grade: Excellence
	<p>For Excellence, the student needs to demonstrate comprehensive understanding of a complex machine.</p> <p>This involves discussing and justifying possible ways of increasing the energy efficiency of a complex machine.</p> <p>There is no student work currently available at this grade.</p> <p>The student would typically examine a range of different complex machines in detail, to evaluate their energy efficiencies and how these are obtained. Using information gained from this discussion, the student would justify possible ways of increasing a particular machine's energy efficiency (e.g. a milling machine).</p> <p>This discussion could include changing an electric motor which drives a pulley system, and discussing and justifying how an increase in energy efficiency would be gained by re-designing the energy transfer to a shaft drive/gear system etc. instead of a pulley.</p> <p>Their discussion could include justifying how energy efficiencies gained by automated feeds differ from those obtained from using manual feeds, and/or how changing cutting speeds, coolants, feed speeds, size of cutters can enhance the energy efficiency of the machine.</p> <p>The student could enhance their report with annotated photographs, diagrams, sketches, a slideshow, and/or video evidence.</p>

	Grade Boundary: Merit
	<p>For Merit, the student needs to demonstrate in-depth understanding of a complex machine.</p> <p>This involves:</p> <ul style="list-style-type: none">• discussing how the components enable a complex machine to achieve its function(s)• evaluating the energy efficiency of a complex machine. <p>There is no student work currently available at this grade.</p> <p>The student would typically discuss how each component works in relation to others to allow the machine to function. For example, for a milling machine, the student would refer to the following, head (vertical/horizontal), bed, table, saddle, feed mechanisms, pedestal, arbor types and adaptors, cutter types, coolant system, cutting speed mechanisms, methods of holding work/types of attachments, and how these combine to produce the overall function of the machine.</p> <p>To support their discussion on how components enable a milling machine to function, the student could explain how components are integrated (setup and operation) to enable a specific engineering part/product to be milled on a milling machine.</p> <p>The student would evaluate the machine to determine its efficiency. For example, for a milling machine, the student would typically refer to input and output speeds, power and/or torque, and present calculations that evaluate the mechanical advantage achieved and energy efficiencies obtained.</p> <p>The student could enhance their report with annotated photographs, diagrams, sketches, a slideshow, and/or video evidence.</p>

	<p>Grade Boundary: Achieved</p>
	<p>For Achieved, the student needs to demonstrate understanding of a complex machine.</p> <p>This involves:</p> <ul style="list-style-type: none"> • explaining the components and function(s) of a complex machine • explaining how a complex machine works using technical language, diagrams and symbols as appropriate • discussing the energy efficiency of a complex machine and how this impacts on the requirements for the machine's energy system. <p>There is no student work currently available at this grade.</p> <p>The student would typically outline the components and how each component works (functions) within a machine. For example, for a milling machine, component explanations could include details about components such as: head (vertical/horizontal), bed, table, saddle, feed mechanisms, pedestal, arbor types, adaptors and other components of the milling machine.</p> <p>The student would typically explain what a machine is used for and the processes it performs using technical language, diagrams, and symbols as appropriate. For example, for a milling machine, the student could refer to a specific engineering part/product to be milled, and explain how the milling machine enables creation of the part/product.</p> <p>The student would typically discuss the energy efficiency of a machine and how this impacts on the requirements for the machine's energy system.</p> <p>For example, for a milling machine, the student's explanation typically includes diagrams/photographs with detailed annotations that discuss why the components of the milling machine were combined the way they were to achieve energy efficiency and presents calculations that describe the mechanical advantage achieved and energy efficiencies obtained.</p> <p>The student could enhance their report with annotated photographs, diagrams, sketches, a slideshow, and/or video evidence.</p>