



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **MEM234020A Coordinate small lot manufacture using rapid manufacture processes**

Release: 1

## **MEM234020A Coordinate small lot manufacture using rapid manufacture processes**

### **Modification History**

New Unit

### **Unit Descriptor**

This unit of competency covers the coordination of rapid manufacture (RM), rapid prototyping (RP) and rapid tooling (RT) processes for single or small lot production. It includes choice of materials, machinery and processes, generation of data and post-processing.

### **Application of the Unit**

This unit applies to the RM of components or prototypes across all forms of manufacturing and engineering. It is suitable for manufacturing maintenance technicians, component and tool designers, and those pursuing engineering or related qualifications and careers.

Prior experience in the application of computer-aided design (CAD), computing technology, mathematics, scientific principles and techniques, materials, methods, processes and mechanical construction techniques is required.

### **Licensing/Regulatory Information**

Not applicable.

### **Pre-Requisites**

Not applicable.

### **Employability Skills Information**

This unit contains employability skills.

## Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

## Elements and Performance Criteria

1	Clarify the production task and elaborate the specifications	1.1	Determine features of object to be produced
		1.2	Determine parameters for the process and production and provide initial advice based on knowledge of rapid processes
		1.3	Assess occupational health and safety (OHS) and regulatory requirements, codes of practice, standards and risk management requirements
		1.4	Confirm object parameters with client
2	Prepare software model and relevant data files for object	2.1	Check or create initial CAD model using appropriate modelling software
		2.2	Select an appropriate rapid processing technology for object implementation
		2.3	Ensure that CAD model data has been pre-processed and the required files have been created for given rapid processing equipment
		2.4	Determine social and sustainability implications of solution
3	Finalise and direct production of first-off prototype	3.1	Finalise selected process ensuring preparation of all required programming and documentation
		3.2	Direct test run first-off sample
		3.3	Obtain sign-off on sample by client
		3.4	Direct production of batch quantity of objects, as required

## Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

### Required skills

Required skills include:

- interpreting features of object, materials, machinery and processes, and parameters for rapid processes
- advising clients based on discipline knowledge and OHS and regulatory standards
- researching sustainability implications and current industrial rapid production techniques
- determining OHS, regulatory and risk management requirements
- investigating, measuring and considering options
- modelling and calculating using appropriate software and validation techniques
- designing components and process adaptations
- communicating, negotiating and reviewing with stakeholders and client throughout object development and manufacture
- documenting process with drawings, specifications and instructions, and storing appropriate data files

### Required knowledge

Required knowledge includes:

- technical and professional support services required to comply with ethical, license, legal and indemnity requirements
- economic, social and environmental implications of rapid processes
- OHS and regulatory requirements, codes of practice, standards, risk management and registration requirements
- factors affecting prototype material, machine and process selection
- current developments in machine and process capabilities for direct and indirectly manufactured components or tools
- machine data, including:
  - data digitising
  - reverse engineering
  - CAD and CAD files:
    - CAD functions, features and techniques related to RP
    - CAD model requirements for effective post-processing and suitability for the rapid process
    - file formats: .STL

- post-processing
- current developments in materials:
  - materials for additive printing processes
  - materials for sprayed metal deposition
  - materials for rapid casting
  - other materials, for example:
    - thermoplastics for vacuum forming
    - materials for rapid machining and fabrication
- documentation, drawings, specifications and instructions required, process information and programming

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

<p>Critical aspects for assessment and evidence required to demonstrate competency in this unit</p>	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> <li>• coordinate small lot manufacture using RM processes</li> <li>• apply RM principles and processes</li> <li>• interpret features of objects, materials, machinery and processes and parameters for rapid processes</li> <li>• advise client based on discipline knowledge and OHS and regulatory standards</li> <li>• research sustainability implications and current industrial design techniques</li> <li>• determine OHS, regulatory and risk management requirements</li> <li>• investigate and measure</li> <li>• model and calculate using appropriate software and validation techniques</li> <li>• generate and evaluate a range of solutions for feasibility against design criteria</li> <li>• communicate, negotiate and review with stakeholders and client throughout process to obtain agreement on proposal and sign-off on design</li> <li>• document design with drawings, specifications and instructions, and store appropriate data files</li> <li>• produce a batch quantity of objects.</li> </ul>
<p>Context of and specific resources for assessment</p>	<ul style="list-style-type: none"> <li>• This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is, the candidate is not in productive work, then a simulated working environment must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.</li> <li>• Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</li> <li>• Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.</li> </ul>
<p>Method of assessment</p>	<ul style="list-style-type: none"> <li>• Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package.</li> <li>• Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant</li> </ul>

	<p>contexts) together with application of underpinning knowledge.</p> <ul style="list-style-type: none"><li>• Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application.</li><li>• Assessment may be applied under project-related conditions (real or simulated) and require evidence of process.</li><li>• Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.</li><li>• Assessment may be in conjunction with assessment of other units of competency where required.</li></ul>
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Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.
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## Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

<b>RM applications</b>	<p>RM applications are found in a variety of industries and for a number of purposes, including products requiring a high degree of customisation, or where speed to market is critical. Examples of rapid manufacturing or ‘mass customisation’ applications include:</p> <ul style="list-style-type: none"> <li>• medical and dental prosthetics and implants</li> <li>• customised components for automotive, aerospace, marine and general product manufacture</li> <li>• jewellery and other art objects</li> <li>• any small to medium quantity item, particularly involving high set-up cost associated with using alternative or traditional methods</li> </ul>
<b>Rapid Prototyping (RP) applications</b>	<p>RP is typically developed for:</p> <ul style="list-style-type: none"> <li>• concept modelling and multiple design iterations at low cost</li> <li>• form, fit and function testing prior to committing to expensive tooling</li> </ul>
<b>Rapid Tooling (RT) applications</b>	<p>RT applications include:</p> <ul style="list-style-type: none"> <li>• tooling for most RM components. Both ‘direct’ and ‘indirect’ methods may be used to produce the tool</li> </ul>
<b>OHS and regulatory requirements, codes of practice, standards and risk management requirements</b>	<p>OHS and regulatory requirements, codes of practice, standards and risk management requirements may include:</p> <ul style="list-style-type: none"> <li>• OHS Acts and regulations</li> <li>• relevant standards</li> <li>• industry codes of practice</li> <li>• risk assessments</li> <li>• registration requirements</li> <li>• safe work practices</li> <li>• state and territory regulatory requirements applying to electrical work</li> </ul>



<b>Standards and codes</b>	Standards and codes refer to all relevant Australian and international standards and codes applicable to a particular rapid processing task
<b>Sustainability</b>	Sustainability is used to mean the entire sustainable performance of the organisation/plant, including: <ul style="list-style-type: none"><li>• meeting all regulatory requirements</li><li>• conforming to all industry covenants, protocols and best practice guides</li><li>• minimising ecological and environmental footprint of process, plant and product</li><li>• maximising economic benefit of process plant and product to the organisation and the community</li><li>• minimising the negative OHS impact on employees, community and customer</li></ul>

## **Unit Sector(s)**

Engineering practice

## **Custom Content Section**

Not applicable.