



**Australian Government**

# **MEM23122 Evaluate computer integrated manufacturing systems**

**Release: 1**

# MEM23122 Evaluate computer integrated manufacturing systems

## Modification History

Release 1. Supersedes and is equivalent to MEM23122A Evaluate computer integrated manufacturing systems.

## Application

This unit of competency defines the skills and knowledge required to evaluate computer integrated manufacturing (CIM) systems used in manufacturing. It includes consideration of hardware, controllers, networks and data handling for business planning and control, manufacturing operations, automation safety, work health and safety (WHS) and risk management compliance, software and system integration.

CIM refers to mechatronic and manufacturing technologies integrated across an enterprise by the communication of data to control plant and operations, plan production, marketing, maintenance and feedback to the business planning process.

It is suitable for people working as manufacturing technicians or paraprofessionals and draftspersons, and for those pursuing manufacturing, engineering or related technical qualifications and careers.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

## Pre-requisite Unit

### MEM23004 Apply technical mathematics

MEM23111 Select electrical equipment and components for engineering applications

MEM23112 Investigate electrical and electronic controllers in engineering applications

## Competency Field

Engineering science

## Elements and Performance Criteria

| Elements                                         | Performance Criteria                                                                                                                                               |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Elements describe the essential outcomes.</i> | <i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>                                                             |
| 1. Determine scope of CIM application            | 1.1 Identify stakeholders to be consulted on the evaluation<br>1.2 Confirm that appropriate support, including technical and professional assistance, is available |

| Elements                                         | Performance Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Elements describe the essential outcomes.</i> | <i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                  | 1.3 Identify WHS and regulatory requirements, codes of practice, standards and risk assessment requirements for CIM systems and automation safety<br>1.4 Identify appropriate analysis techniques, software techniques and graphics required for evaluation<br>1.5 Identify stakeholders to be consulted on evaluation tasks<br>1.6 Investigate sustainability implications of CIM systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2. Evaluate CIM components and systems           | 2.1 Evaluate parameters and requirements of manufacturing operations<br>2.2 Evaluate machines, processes and data flow for machine and process control in CIM systems<br>2.3 Evaluate system control, signal generation and conditioning, controller functions and actuator power interfacing<br>2.4 Evaluate data collection, sharing and control software and programming for hardware integration<br>2.5 Evaluate data and communications protocols, standards and network topologies for the application<br>2.6 Evaluate system integration of hardware, controllers, human-machine interfaces (HMIs) and graphical user interfaces (GUIs) and network<br>2.7 Evaluate system analysis and simulation software and validation techniques<br>2.8 Evaluate automation safety and compliance with WHS, regulatory requirements, standards and risk management implementation |
| 3. Report results                                | 3.1 Record results and process of system evaluation<br>3.2 Provide documentation including layouts, programs, flow charts and files                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

## Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Automation safety refers to use of general and specific safety features and includes:        | <ul style="list-style-type: none"> <li>• emergency stop</li> <li>• failsafe design</li> <li>• redundancy</li> <li>• interlocks</li> <li>• guarding data integrity</li> <li>• general plant design and use</li> <li>• functional safety of safety-related electrical, electronic and programmable electronic control systems.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Appropriate technical and professional assistance includes:                                  | <ul style="list-style-type: none"> <li>• technical support and advice relating to elements which have intrinsic dangers</li> <li>• professional support for technologies.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Work health and safety (WHS), regulatory requirements and organisational procedures include: | <ul style="list-style-type: none"> <li>• WHS acts, regulations and relevant standards</li> <li>• codes of practice from Australian and overseas engineering and technical associations and societies</li> <li>• risk assessments</li> <li>• registration requirements</li> <li>• safe work practices</li> <li>• state and territory regulatory requirements.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Computer integrated manufacturing (CIM) hardware includes:                                   | <ul style="list-style-type: none"> <li>• robots</li> <li>• pick and place, materials handling, automated guided vehicles (AGVs) and transfer devices</li> <li>• fluid power components</li> <li>• pumping and wash equipment</li> <li>• boilers, heating and drying equipment</li> <li>• pasteurising, chilling and refrigeration equipment</li> <li>• welding equipment</li> <li>• moulding, casting and forging equipment</li> <li>• pressing, forming, drawing and cropping equipment</li> <li>• surface finishing, plating and painting</li> <li>• packaging equipment</li> <li>• mechanical linkages and support structures</li> <li>• pressure, temperature, proximity sensor and transducers, relative and absolute encoders, vision systems and smart cameras</li> <li>• controllers, programmable logic controllers (PLCs) and remote telemetry units (RTUs)</li> <li>• human-machine interfaces (HMIs) including touch screens</li> <li>• power interfaces and signal processors for digital and analog</li> </ul> |

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|                                                                                         | <p>control</p> <ul style="list-style-type: none"> <li>• stepper motors</li> <li>• servo motors, torque, speed and position control</li> <li>• special purpose equipment including package labelling equipment, logistics and warehousing requirements</li> <li>• wired and wireless networking systems.</li> </ul>                                                                                                                                                                                                                        |
| Data and communications protocols and standards include:                                | <ul style="list-style-type: none"> <li>• layered communications and networking protocols</li> <li>• Open Systems Interconnection Model (OSI Model) – seven layers</li> <li>• TCP/IP Internet Protocol Suite {Transmission Control Protocol (TCP) and the Internet Protocol (IP)} – four or five layers</li> <li>• IEEE 802 LAN/MAN group of standards, including IEEE 802.3 Ethernet standard, IEEE 802.11 Wireless networking standard</li> <li>• interface standards including RS232 and RS485, Fieldbus, Modbus and DNP3.0.</li> </ul> |
| Network topology includes:                                                              | <ul style="list-style-type: none"> <li>• bus</li> <li>• ring</li> <li>• star</li> <li>• tree</li> <li>• mesh</li> <li>• in-line (two-way communications) arrangements</li> <li>• wired and wireless options.</li> </ul>                                                                                                                                                                                                                                                                                                                   |
| Sustainability includes:                                                                | <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 WHS impact on employees, community and customer.</li> </ul>                                                                      |
| Continuous improvement implementation includes one or more of the following techniques: | <ul style="list-style-type: none"> <li>• balanced scorecard</li> <li>• current and future state mapping</li> <li>• measuring performance against benchmarks</li> <li>• process improvement, problem solving and decision making</li> <li>• data management, generation, recording, analysing, storing and use of software</li> <li>• training for improvement systems participation</li> <li>• technical training.</li> </ul>                                                                                                             |

## Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM23122A Evaluate computer integrated manufacturing systems.

## Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>