



Australian Government

MEM23112 Investigate electrical and electronic controllers in engineering applications

Release: 1

MEM23112 Investigate electrical and electronic controllers in engineering applications

Modification History

Release 1. Supersedes and is equivalent to MEM23112A Investigate electrical and electronic controllers in engineering applications.

Application

This unit of competency defines the skills and knowledge required to investigate new or existing controllers for suitability in automated systems used in engineering applications. It includes the application of fundamental controller programming techniques and control system power supply requirements, basic programmable logic controller (PLC), microcontroller and supervisory control and data acquisition (SCADA) applications.

It applies to controllers used in automated systems in industry where typical applications of the unit include assessing the ongoing suitability of existing controllers, programming of PLCs, adjustments to controllers for new equipment or products, and condition monitoring.

It is suitable for people working as automation or mechatronics technicians, for people using the services of electrical and control systems technicians, and for those pursuing careers and qualifications in mechatronic or automated system design and maintenance.

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

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 electro and controller operation	1.1 Assess current or proposed controller context for electrical and automation safety and risks 1.2 Identify potential or actual dangerous high currents and voltages and check for regulatory compliance requirements related to extra low, low

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	and high voltage applications 1.3 Identify work health and safety (WHS) and regulatory requirements, codes of practice, standards, risk management and organisational procedures, including those related to automation safety 1.4 Identify stakeholders to be consulted on investigation task 1.5 Investigate software and software techniques required for basic analysis and graphics required for controller investigation task 1.6 Ensure appropriate support including licensed electrical, technical and professional assistance is available
2. Review functions and features needed in controller application	2.1 Use analytical and graphical software to review controller application and function 2.2 Validate software results 2.3 Undertake required instrument readings
3. Program controllers and SCADA applications for required functions	3.1 Program controller for required sequencing and actuations for applications 3.2 Develop simple SCADA applications for required interactions with inputs and outputs of controllers
4. Report results	4.1 Record outcomes of investigation, evaluation and application 4.2 Provide documentation including calculations, diagrams, programs 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.	
Controllers include:	• PLCs and microcontrollers • DCS • SCADA • other systems and equipment, including proprietary equipment.
Controller tasks include:	• determining WHS, regulatory, risk management and automation safety requirements • programming and interfacing a PLC capable of sequencing two or more actuations with start, stop and actuation motion confirmation signals • developing a simple SCADA application capable of interacting with inputs and outputs of PLCs and/or microcontrollers.
Automation safety refers to use of general and specific safety features and includes:	• emergency stop • failsafe design • redundancy • interlocks • guarding data integrity.
Appropriate licensed trade technical and professional assistance include:	• availability of licensed electrical tradespersons for work covered by electrical licensing regulations • technical support and advice relating to elements which have intrinsic dangers • professional support for technologies.
WHS, regulatory requirements and organisational procedures include:	• WHS acts, regulations and relevant standards • codes of practice from Australian and overseas engineering and technical associations and societies • risk assessments • registration requirements • safe work practices • state and territory regulatory requirements applying to electrical work.
Sustainability includes:	• meeting all regulatory requirements • conforming to all industry covenants, protocols and best practice guides • minimising ecological and environmental footprint of process, plant and product • maximising economic benefit of process plant and product to the organisation and the community • minimising the negative WHS impact on employees, community and customer.

-
-

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM23112A Investigate electrical and electronic controllers in engineering applications.

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet -

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

Assessment Requirements for MEM23112 Investigate electrical and electronic controllers in engineering applications

Modification History

Release 1. Supersedes and is equivalent to MEM23112A Investigate electrical and electronic controllers in engineering applications.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include:

- identifying and applying work health and safety (WHS), regulatory and risk management procedures
- reviewing dangers and the effects of electricity on humans
- identifying effects and dangers of electricity, automated systems and specialist requirements including licensing related to technical work
- reviewing sustainability implications, functions and features of controllers and related devices, machines and systems on at least two occasions
- assessing and applying basic electrical and electronic control principles, controller programming principles and techniques to simple machine control functions on at least two occasions
- ensuring safe electrical working practice
- ensuring clear and logical process of analysis
- reporting and documenting processes and results of evaluation including calculations, diagrams, programs and files.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- effects of electricity on humans
- electrical laws:
 - Ohm's law
 - Kirchhoff's voltage and current laws
 - analogies with hydraulics, pressure drop and continuity
- function of controllers used in engineering applications
- licensed technical and professional assistance
- automated systems and mechatronic devices (note: this unit does not include design or modification of interfacing with these devices)

- common software requirements of control systems, including supervisory control and data acquisition (SCADA), distributed control systems (DCS) and programming
- programmable logic controllers (PLC) and microcontroller basic programming functions
- SCADA including basic editing and programming techniques
- documentation techniques, circuit diagrams, programs and applications
- specifications for hardware applicable to controller techniques in engineering.
-

Assessment Conditions

- Assessors must:
 - have vocational competency in investigating electrical and electronic controllers in engineering applications at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the Standards for Registered Training Organisations 2015 or its replacement and comply with the National Vocational Education and Training Regulator Act 2011, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
-

Links

The MEM Metal and Engineering Training Package Companion Volume Implementation Guide is available from VETNet -

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