



Australian Government

MEM18067 Tune control loops - multi controller or multi element systems

Release: 1

MEM18067 Tune control loops - multi controller or multi element systems

Modification History

Release 1. Supersedes and is equivalent to MEM18067B Tune control loops – multi controller or multi-element systems

Application

This unit of competency defines the skills and knowledge required to determine and record control loop responses in open and closed loop modes, tune control loops and complete service records.

Included is the application of step response (open loop tuning calculations and closed loop ultimate sensitivity trials) to achieve specified loop characteristics in conformance to operational specifications.

Where fault-finding is required to electronic component level unit MEM18056 Diagnose and repair analog equipment and components should also be selected.

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

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM12023	Perform engineering measurements
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM18002	Use power tools/hand held operations
MEM18054	Fault find, test and calibrate instrumentation systems and equipment
MEM18055	Dismantle, replace and assemble engineering components

Plus, one or more of the following, including their prerequisites:

MEM18062	Install, maintain and calibrate instrumentation sensors, transmitters and final control elements
MEM18064	Maintain instrumentation system components

Competency Field

Maintenance and diagnostics

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

1	Determine job requirements	1.1	Follow standard operating procedures (SOPs)
		1.2	Comply with work health and safety (WHS) requirements at all times
		1.3	Use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	Determine control loop characteristics	2.1	Examine engineering specifications, technical information and historical process, records and trends for relevant data
		2.2	Carry out consultation with system operators and other relevant plant personnel and extract relevant data and document to procedures
		2.3	Read programmed maintenance/service reports and note relevant data
		2.4	Analyse data and ascertain control loop characteristics
3	Record control loop responses	3.1	Record control loop responses in open and closed loop mode using chart recorders and data loggers

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

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| | | 3.2 | Test unit for tuning using appropriate diagnostic techniques |
| | | 3.3 | Analyse diagnostic results against specifications |
| 4 | Tune control loops | 4.1 | Perform tuning operations by applying control loop device characteristics, controller mode principles and adjustment methods using appropriate equipment, procedures and techniques |
| | | 4.2 | Monitor and adjust control loop components during controller tuning operation using test recording equipment |
| | | 4.3 | Apply step response – open loop tuning calculations to achieve specified loop characteristics |
| | | 4.4 | Use closed loop tuning methods incorporating ultimate sensitivity and systematic trials to achieve specified loop characteristics |
| | | 4.5 | Use correct sequence of tuning on multi controllers and/or multi element systems to achieve specified characteristics |
| | | 4.6 | Tune control loops to optimum mode settings |
| | | 4.7 | Recommission process control loop to specifications |
| 5 | Complete service reports | 5.1 | Adopt appropriate follow-up procedures |
| | | 5.2 | Complete service reports according to SOPs |

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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.

Historical trends

include one (1) or more of the following:

- supervisory control and data acquisition (SCADA)
- charts
- chart recorders and data loggers
- equipment conditioning monitoring

An open and closed loop system includes:

- final control elements
- process measuring devices
- converters
- controllers
- process signals

Test and recording equipment for the monitoring and adjustment of control loop tuning includes the use of one (1) or more of the following:

- pneumatic
- analog electronic
- digital electronic

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM18067B Tune control loops – multi controller or multi-element systems

Links

Companion Volume implementation guides are found in VETNet -

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

Assessment Requirements for MEM18067 Tune control loops - multi controller or multi element systems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting engineering specifications, technical information, diagrams and drawings, documents and historical records and obtaining relevant data with respect to tuning control loops
- consulting with system operators and other relevant personnel with respect to the control loop characteristics, including an open and closed loop system and confirming function/malfunction of the system and/or its components
- checking operational characteristics of the control devices, signal conversion instruments and final control elements for conformance to specifications
- locating, reading and interpreting in-built fault indicators and error codes and identifying faults/defects in control system
- obtaining relevant pneumatic, electrical and electronic circuit diagrams and testing and monitoring control loop for correct operation and recording the operational responses of the control system/loop
- using fault-finding and diagnostic techniques and procedures throughout the monitoring and testing phase and comparing collected data with the operational specifications of the control system
- dismantling/disassembling serviceable items using appropriate tools, techniques and procedures
- setting and adjusting the controller modes using appropriate test and calibration equipment for the monitoring and adjustment of control loop tuning
- checking the control instrumentation for correct zero, span and range and making final adjustments, as required
- tuning the control loop to optimum mode settings and recommissioning the control system
- completing all service reports, including appropriate follow up procedures in accordance with SOPs.

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:

- safe work practices and procedures and use of personal protective equipment (PPE)
- proportional integral differential (PID) control loops tuning/calibration techniques
- mathematical computations, including algebra, exponentials and logarithms, equations, graphs, charts, vectors, complex numbers and Boolean algebra
- relevant data, including information from in-built devices on the control loop characteristics
- specifications of each system component
- control programming
- supervisory control and data acquisition (SCADA) systems, programmable logic controller (PLC) systems, distributive control systems (DCS) and computer-based systems
- procedures for:
 - documenting/reporting information
 - documenting control system tests and analysis
 - isolating and testing the control system and its components
 - verifying apparent faults in circuits and/or control system components
 - dismantling/ disassembling components for repair or replacement
 - assembling repaired and/or replacement items
 - calibration of control system components and necessary equipment
 - checking control instruments for zero, span and range
 - making final adjustments to ensure all control system components conform to specification
 - commissioning the control system
- signal transmission, including the principles of operation of the final control element, procedures for calibrating and adjusting the control system
- correct function of the circuits and components within the control loop
- calibration and adjustment methods for the control loop devices
- configuration of the digital control system software
- operational responses and procedures for monitoring and recording test and operational data
- fault-finding and diagnostic techniques throughout the monitoring and testing process
- deviations/variations from specification
- correct maintenance procedures for serviceable item(s)
- adjustments which affect the calibration to control system components
- controller modes and actions
- reporting/recording requirements associated with the commissioning of the control system
- follow-up actions to be undertaken after maintaining/repairing control system instrumentation.

Assessment Conditions

- Assessors must:

- have vocational competency in tuning control loops – multi controller or multi-element systems 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. This must 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.

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