



Australian Government

PMASUP341 Monitor and maintain instrument and control systems

Release: 1

PMASUP341 Monitor and maintain instrument and control systems

Modification History

Release 1. Supersedes and is equivalent to PMASUP341B Monitor and maintain instrument and control systems

Application

This unit of competency covers the skills and knowledge required to monitor and maintain instrument/electrical systems used for process measurement and control of a process.

This unit of competency applies to process technicians and those in similar roles who are required to test, repair, recommission instrumentation and control systems in the facility; issue permits to allow work to be undertaken; verify equipment operation; calibrate instrumentation; troubleshoot problems; and prepare reports related to the equipment/systems.

This unit of competency applies to any control system/instrumentation forming part of a control system, including those for compressor systems, prime movers, valve systems and systems measuring/controlling flow, pressure or temperature. Control systems can be pneumatic, electrical/electronic, electro-pneumatic, computer-based, and so on.

This unit of competency applies to an individual working alone or as part of a team or group and working in liaison with other shift team members and the control room operator, as appropriate.

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

Pre-requisite Unit

MSMPER300 Issue work permits

Competency Field

Support

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.

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

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|---|---|---|
| 1 | Monitor equipment operation | <div style="padding-left: 20px;"><div style="padding-left: 20px;">1.1 Monitor equipment operation according to instrument/electrical equipment operating principles and parameters</div><div style="padding-left: 20px;">1.2 Access and interpret relevant technical drawings and schematics to determine system faults</div><div style="padding-left: 20px;">1.3 Issue permit to work to allow work to be undertaken</div><div style="padding-left: 20px;">1.4 Verify equipment operation/performance through test procedures to ensure correct operation and to confirm identified problems from other sources</div><div style="padding-left: 20px;">1.5 Correct operational variations through calibration and adjustment</div><div style="padding-left: 20px;">1.6 Document operational variations</div></div> |
| 2 | Test/repair equipment | <div style="padding-left: 20px; padding-top: 20px;"><div style="padding-left: 20px;">2.1 Verify equipment is operating correctly and document test results</div><div style="padding-left: 20px;">2.2 Apply appropriate troubleshooting techniques to determine the cause of operational faults</div><div style="padding-left: 20px;">2.3 Rectify operational faults through the application of relevant maintenance procedures</div><div style="padding-left: 20px;">2.4 Isolate, remove and dispose of faulty equipment, and install new equipment</div><div style="padding-left: 20px;">2.5 Verify the performance of newly installed equipment to ensure it meets required operational parameters and conditions</div><div style="padding-left: 20px;">2.6 Record all repairs/installations to provide historical records of the condition of system equipment</div></div> |
| 3 | Recommission systems and equipment | <div style="padding-left: 20px; padding-top: 20px;"><div style="padding-left: 20px;">3.1 Recommission repaired/installed equipment to online operation in the correct sequence at the required operational parameters</div><div style="padding-left: 20px;">3.2 Monitor or activate systems to ensure they are operating both safely and effectively</div><div style="padding-left: 20px;">3.3 Close out permit to work and restore site/system to</div></div> |

normal operation

- | | | | |
|---|------------------------------------|-----|--|
| 4 | Compile and analyse reports | 4.1 | Collect information concerning deviations/repairs equipment and put into accepted reporting format |
| | | 4.2 | Compile reports ensuring they provide an accurate and ongoing record of deviations in pipeline processes and a current record of pipeline and equipment trends |
| | | 4.3 | Utilise information or reports for short and long-term deviation control planning |

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.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used, and include one or more of the following:

- legislative requirements, including work health and safety (WHS)
- industry codes of practice and guidelines
- environmental regulations and guidelines
- Australian and other standards
- licence and certification requirements

All operations to which this unit applies are subject to stringent health, safety and environment (HSE) requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE

requirements take precedence.

Procedures

All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, include one or more of the following:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant

Instrument and control systems

This unit of competency includes all such items of equipment and unit operations which form part of the instrument and control systems for plant units, such as:

- compressor systems and equipment – instrumentation and control systems include one or more of the following:
 - compressors, monitoring systems, power supply systems, pumps, pumping systems and equipment, pressure vessels/filtration equipment, coolers, scrubbers, expanders, anti-surge systems, safety systems and compressor control systems
- prime movers, such as turbine engines, reciprocating engines, electric motors – instrumentation and control systems include one or more of:
 - fuel and carburettion systems, ignition systems, lubrication systems, induction and exhaust systems, governing systems, power supply systems, safety and shutdown systems
- flow systems – instrumentation and control systems include one or more of the following:
 - piping systems, metering equipment, flow control equipment, pressure and temperature transmitters and transducers, telemetry equipment, programmable logic controllers (PLCs), flow computers, electro-pneumatic process control equipment and their associated online analytical instrumentation, such as gas chromatographs, moisture

- analysers, gas sampling and gas analysis equipment and pig
- valve systems – instrumentation and control systems include one or more of the following:
 - non-control valves, control and shut off valves, non-return or check valves and pressure relief valves, manual hand operated actuator, gas/hydraulic actuator and pneumatic valves

Instrument/electrical systems

Instrument/electrical systems include one or more of the following:

- process analysing systems, eg gas analysis
- emergency shutdown systems (ESD)
- fire systems
- pressure and temperature control systems
- metering systems (e.g. orifice, turbine and positive displacement)
- telemetry and supervisory control and data acquisition (SCADA) systems
- communications systems
- solar systems
- utility systems

Types of faults

Types of faults include one or more of the following:

- material leaks
- electrical problems
- compressor or pump failure
- out of current inspection status
- gauge failure or hose rupture/leaks
- instruments out of calibration
- non-flow of material
- instruments and equipment requiring cleaning

Test equipment

Test equipment will be selected as required from one or more of the following:

- dead weight tester
- transmission unit
- ice point tester
- decade box
- multimeter
- resistance temperature device (RTD) calibrator

- chart recorders
- data logging equipment

Unit Mapping Information

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Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=9fc2cf53-e570-4e9f-ad6a-b228ffdb6875>

Assessment Requirements for PMASUP341 Monitor and maintain instrument and control 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, and include the ability to:

- test, repair, recommission and monitor the operational condition of instrument control systems
- isolate and de-isolate equipment
- read and interpret schematics, technical drawings and technical information
- isolate the causes of problems and distinguish between causes of problems/alarm/fault indications, including:
 - instrument failure/malfunction
 - electrical failure/malfunction
 - mechanical failure/malfunction
 - equipment design deficiencies
 - product parameters (temperature, flows, pressure and levels)
 - process control system malfunction
 - power/utility failures
- issue permits to allow work to be undertaken
- verify equipment operation
- prepare and analyse reports related to the equipment/ systems.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- process and plant schematic and instrumentation diagrams
- types and functions of instrumentation and control devices
- control functions, control regimes, adjustments and tuning
- types and application of test and calibration methods
- types and application of test equipment typically used with control system repair/maintenance/calibration
- short and long-term deviation control planning
- organisation procedures, including those covering
 - safety, emergency and hazard control
 - work permit systems

- maintenance
- standard operating procedures (SOPs)
- hierarchy of control.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence based on a holistic assessment of the evidence.
- The collection of performance evidence:
 - should occur over a range of situations which include typical disruptions to normal, smooth operations
 - will typically include a supervisor/third-party report focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
 - must include the testing and repair of at least three (3) items of equipment, use of appropriate tools, equipment and safety gear requiring demonstration of preparation, operation, completion and responding to problems
 - may use industry-based simulation for all or part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should 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 reflecting 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.
- Assessment in a simulated environment should use evidence collected from one or more of:
 - walk-throughs
 - pilot plant operation
 - demonstration of skills
 - industry-based case studies/scenarios
 - 'what ifs'.
- Knowledge evidence may be collected concurrently with performance evidence (provided a record is kept) or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept).
- 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.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.

- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition, the assessor or anyone acting in subject matter expert role in assessment must demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they must assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
 - relevant VET or other qualification/Statement of Attainment
 - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
 - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
 - being currently employed undertaking the type of work being assessed
 - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures
 - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
 - conducting on-the-job training/assessments of the type of work being assessed
 - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

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