



Australian Government

**MEM09213A Produce schematic drawings
for hydraulic and pneumatic fluid power
systems**

Release: 1

MEM09213A Produce schematic drawings for hydraulic and pneumatic fluid power systems

Modification History

Release 1 - New unit of competency

Unit Descriptor

This unit of competency covers the skills and knowledge required to produce detailed engineering drawings for hydraulic and pneumatic fluid power systems. The systems may be installed on individual stationary or mobile equipment or be part of a distributed system powered from a source separate from the equipment or machine where the hydraulic or pneumatic power is applied.

Application of the Unit

This unit is suitable for individuals undertaking drafting in manufacturing and other industries that use fluid power equipment. The unit can apply to preparing drawings of whole or part of the fluid power system. Drawings will usually be carried out with the use of computer-aided design (CAD) systems but may also be done manually. Drawings are produced to Australian Standard (AS) 1100.101–1992 Technical drawing – General principles, from predetermined critical dimensions and specifications. If CAD systems are to be used, the unit MEM30031A Operate computer-aided design (CAD) system to produce basic drawing elements, should also be selected.

Licensing/Regulatory Information

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

Pre-Requisites

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| MEM09002B | Interpret technical drawing |
| MEM09204A | Produce basic engineering detail drawings |

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

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| 1 | Determine schematic drawing requirements | 1.1 | Check purpose, scope and information requirements for drawing |
| | | 1.2 | Interpret available information relevant to project and work requirements, and identify and address further information needs |
| | | 1.3 | Identify and prepare equipment required to complete work |
| | | 1.4 | Identify and apply relevant codes, standards and symbols used in the mechanical services industry for installation drawings |
| | | 1.5 | Identify and access organisational files, templates and symbols as required for work |
| | | 1.6 | Identify the features and operational function of basic pneumatic and hydraulic systems |
| 2 | Identify system components | 2.1 | Identify gas or fluid used in the fluid power system |
| | | 2.2 | Identify typical hydraulic system components and their function |
| | | 2.3 | Identify typical pneumatic system components and their function |
| | | 2.4 | Identify environmental implications of inefficient fluid power systems and strategies for minimising impact |
| | | 2.5 | Read and interpret the applicable sections of manufacturer's tables, charts, catalogues and specifications |

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| 3 | Produce hydraulic system schematic drawing | 3.1 Apply operating principles and specifications of hydraulic system and components to drawing work |
| | | 3.2 Complete schematic drawing according to industry standard for hydraulic fluid power systems, including use of accurate symbols and notations |
| | | 3.3 Complete circuit diagram according to industry standard for hydraulic fluid power systems, including use of accurate symbols and notations |
| | | 3.4 Ensure schematic drawing is presented according to organisational requirements and contains all relevant information |
| | | 3.5 Store schematic drawings according to organisational filing system |
| | | 3.6 Apply workplace occupational health and safety (OHS) and environmental procedures |
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| 4 | Produce pneumatic system schematic drawing | 4.1 Apply operating principles and specifications of pneumatic system and components to drawing work |
| | | 4.2 Complete drawing according to industry standard for pneumatic fluid power systems, including use of accurate symbols and notations |
| | | 4.3 Complete circuit diagram according to industry standard for pneumatic fluid power systems, including use of accurate symbols and notations |
| | | 4.4 Ensure drawing is presented according to organisational requirements and contains all relevant information |
| | | 4.5 Store schematic drawings according to organisational filing system |
| | | 4.6 Apply workplace OHS and environmental procedures |
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| 5 | Consult appropriately with other | 5.1 Verify the parameters of the brief and clarify specifications with appropriate personnel |
| | | 5.2 Identify and consult with support services, as required |

disciplines 5.3 Present and explain drawings and diagrams at appropriate stages of the project

Required Skills and Knowledge

Required skills

Required skills include:

- literacy skills sufficient to read and interpret instructions, relevant codes of practice and specifications for drawing work
- numeracy skills sufficient to interpret technical information and conduct mathematical problem solving as required in the scope of this unit
- numeracy skills, including four basic functions, fractions, and simple algebra and formulae sufficient to calculate flow, volume, area, pressure and other necessary parameters relevant to a fluid power system
- using and maintaining drawing equipment
- applying relevant codes, standards and symbols used for hydraulic and pneumatic systems
- drafting skills, including:
 - applying spatial principles to achieve scale and proportion
 - using appropriate lines and symbols
 - dimensioning and tolerancing
 - production of title block, material lists and other appropriate symbols

Required knowledge

Required knowledge includes:

- general knowledge of different approaches to drawing schematics
- awareness of copyright and intellectual property issues and legislation in relation to drawing
- environmental and OHS issues associated with the tools and materials used for drawing
- quality assurance procedures
- order of drawing process
- company checking procedures for drawings
- operating principles of pneumatic systems and components
- operating principles of hydraulic systems and components

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.

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| <p>Overview of assessment</p> | <p>A person who demonstrates competency in this unit must be able to interpret and apply drawing specifications and industry standards in the production of drawings and schematics for the pneumatic and hydraulic fluid power systems.</p> |
| <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 perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.</p> <p>Specifically the candidate must be able to:</p> <ul style="list-style-type: none"> • work within typical site/teamwork structures and methods • apply worksite communication procedures • comply with organisational policies and procedures, including quality requirements • participate in work meetings • comply with quality requirements • use industry terminology • apply appropriate safety procedures • produce schematic drawings of hydraulic and pneumatic power systems according to industry standard and client requirements. |
| <p>Context of and specific resources for assessment</p> | <p>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 an appropriate simulation 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.</p> <p>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</p> <p>Access must be provided to appropriate learning</p> |

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| | <p>and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.</p> <p>This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with drafting or other units requiring the exercise of the skills and knowledge covered by this unit.</p> |
| Method of assessment | <p>Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways, including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.</p> |

Range Statement

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| Available information | <p>Available information may include:</p> <ul style="list-style-type: none"> • construction documents • building and coordination information • work specifications • information for plant services equipment • industry codes, standards and regulations • design brief |
| Typical hydraulic components | <p>Typical hydraulic components include:</p> <ul style="list-style-type: none"> • basic drive circuits • basic safety/relief circuits • control components, including: <ul style="list-style-type: none"> • programmable logic controllers (PLCs) • other input/output circuitry • sensors • limit switches and stops |

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| | <ul style="list-style-type: none"> • mnemonic coding and associated equipment • human interface equipment (e.g. terminals, key pads, levers, switches and buttons) • fluid reservoirs • piping and hoses and associated fittings • pumps • filters • valves • control gear • drive/displacement units • filters and strainers • gauges and instruments, including: <ul style="list-style-type: none"> • pressure and temperature gauges • liquid level gauges • thermometers • thermocouples • manometers • piezometers • pumps, motors/turbines • linear actuators |
| <p>Typical pneumatic components</p> | <p>Typical pneumatic components include:</p> <ul style="list-style-type: none"> • control system, including: <ul style="list-style-type: none"> • PLCs • other input/output circuitry • sensors • limit switches and stops • mnemonic coding and associated equipment • human interface equipment (e.g. terminals, key pads, levers, switches and buttons) • receivers and other reservoirs • interlocks • piping and tubing • pumps • compressors • strainers and filters • valves • drive/displacement units • pipes (rigid and flexible) • valves (types and functions) • filters (types and functions) |

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| | <ul style="list-style-type: none"> • gauges and instruments: <ul style="list-style-type: none"> • pressure and temperature gauges • liquid level gauges • thermometers • thermocouples • manometers • piezometers • pipe fittings (elbows/bends) • air motors • linear actuators |
| Pneumatic system diagrams | <p>Pneumatic system diagrams may include:</p> <ul style="list-style-type: none"> • basic drive circuits • basic safety/relief circuits • control circuits • pressure reducing volume/flow control • sensing circuits |
| Appropriate personnel | <p>Appropriate personnel may include:</p> <ul style="list-style-type: none"> • designer • engineer • supervisor |
| Support services | <p>Support services may include:</p> <ul style="list-style-type: none"> • estimating department and personnel • engineering department and personnel • drafting department and personnel • project manager • factory manager or staff |

Unit Sector(s)

Drawing, drafting and design

Custom Content Section

Not applicable.