



Australian Government

MEM48029 Interpret and produce complex binary phase diagrams

Release: 1

MEM48029 Interpret and produce complex binary phase diagrams

Modification History

Release 1. Supersedes and is equivalent to MSATCM518A Interpret complex binary phase diagrams.

Application

This unit defines the skills and knowledge required to interpret complex phase diagrams and so predict the microstructures of binary alloys and the behaviour of metals and alloys under quenching. It also includes the production of diagrams.

The unit applies to the interpretation and production of cooling phase diagrams used in metallurgy. The application will primarily be to phase diagrams of metals and alloys showing temperature and composition variables.

It applies where a metallurgy technician is required to recommend a phase transition process in order to obtain a required microstructure, or to predict a microstructure from a known phase transition process.

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

Pre-requisite Unit

MEM48004 Interpret basic binary phase diagrams.

Competency Field

Metallurgy

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 job requirements	1.1 Follow standard operating procedures (SOPs) 1.2 Comply with work health and safety (WHS) requirements at all times 1.3 Identify job requirements from specifications
2. Interpret cooling phase diagrams	2.1 Obtain phase diagram for metal or alloy from internal or external sources

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	2.2 Review diagram and identify number, composition, proportion and structural arrangement of phases including intermediate phases in binary alloys 2.3 Identify microstructures in terms of their structure, phase changes, intermetallic compounds and solid solutions 2.4 Establish the final microstructures of binary alloys cooled under equilibrium conditions from the melt or during heat treatment and quenching operations 2.5 Determine and accurately record workplace implications of diagram information
3. Produce cooling phase diagrams	3.1 Identify scope and nature of data required to produce diagram 3.2 Identify and access data sources 3.3 Use data from thermal analysis to create accurate and complete diagram

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.

Specifications include one or more of the following:	- drawings - job sheets - work instructions.
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Unit Mapping Information

Release 1. Supersedes and is equivalent to MSATCM518A Interpret complex binary phase diagrams.

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 MEM48029 Interpret and produce complex binary phase diagrams

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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:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting the microstructures from equilibrium and non-equilibrium cooling phase diagrams on at least two occasions each including:
- estimating composition from the structure of a phase diagram
- predicting structure from the composition from a phase diagram
- producing a complex cooling phase diagram from supplied data on at least two occasions.

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:

- safe work practices and procedures
- methods of construction of phase diagrams for binary alloys
- types of cooling phase diagrams:
 - equilibrium phase diagrams
 - non-equilibrium phase diagrams
- scientific techniques and principles as they relate to:
 - effect of temperature and alloying elements on structural changes
 - structures of homogenous and cored dendrites
 - structures of columnar and equiaxed grains
 - eutectic, eutectoid and peritectic reactions
- phase changes that occur in binary alloy systems through heating, slow cooling and quenching as recorded by the appropriate phase diagrams
- scientific techniques and principles of cooling phase diagrams
- characteristic microstructures of binary alloys including structures:
- equilibrium and non-equilibrium cooling of binary alloys and the resulting microstructures in cast and heat-treated material including:

- structures of dendrites (homogeneous and cored) columnar and equiaxed grains
- structures resulting from eutectic, eutectoid and peritectic reactions
- structures resulting from solid state precipitation
- structures resulting from different quenching rates.
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Assessment Conditions

- Assessors must:
 - have vocational competency in interpreting and producing complex binary phase diagrams 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.
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