



Australian Government

MEM24016 Perform eddy current array tests

Release: 1

MEM24016 Perform eddy current array tests

Modification History

Release 1. New unit.

Application

This unit of competency defines the skills and knowledge required by non-destructive testing (NDT) technicians to perform eddy current array testing to the level described in relevant Australian and international standards and codes. The unit applies to eddy current array testing undertaken in a range of industrial applications including testing on fabrications, structures and components. Eddy current array testing may be performed by NDT technicians in a wide range of industries and sectors including mechanical or mechatronics engineering, maintenance, manufacturing, construction, mining, oil/gas, and associated industry sectors.

The unit covers calibration, set-up, and use of eddy current array fixed and mobile testing equipment, selection of the most appropriate testing technique and probes, interpreting results including classifying defects and reporting of test results. Techniques covered include eddy current array surface testing and eddy current array tube testing.

Where interpretation of technical drawings is required, unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required, unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of power tools are required, unit MEM18002 Use power tools/hand held operations should also be selected.

No licensing or legislative requirements apply to this unit at the time of publication. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712 Non-destructive testing — Qualification and certification of personnel.

Band: B

Unit Weight: 6

Pre-requisite Unit

MEM11011 Undertake manual handling

MEM13015 Work safely and effectively in manufacturing and engineering

MEM16006 Organise and communicate information

MEM18001 Use hand tools

MEM24006 Perform eddy current testing

MEM24020 Apply materials technology principles to non-destructive testing

Competency Field

Non-destructive testing

Elements and Performance Criteria

Elements	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, job sheets or work instructions
2. Prepare for testing	2.1 Liaise with client to explain testing requirements and schedule tests to minimise disruption 2.2 Arrange safe access to testing site(s) and identify inspection areas 2.3 Clean and prepare for testing using appropriate procedures and materials 2.4 Assess inspection areas visually and identify obvious discontinuities
3. Conduct eddy current array tests	3.1 Select the most appropriate eddy current array test technique for the material or application 3.2 Select test equipment and appropriate probe type and shape 3.3 Conduct reference calibration in accordance with relevant standards, codes and/or procedures 3.4 Optimise test set up by calculating effects on probe dimensions, frequency and phase of induced field and material conductivity on eddy current penetration 3.5 Conduct eddy current test(s) in accordance with relevant standards, codes, work instructions and WHS requirements 3.6 Store and maintain eddy current array testing equipment in accordance with SOPs and WHS requirements
4. Interpret and report results of eddy current array tests	4.1 Monitor scans and assess indications for discontinuities, defects and other data required in test report 4.2 Apply acceptance criteria to discontinuities to detect defects 4.3 Classify defects in accordance with test specification and relevant

Elements	Performance Criteria
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	standards 4.4 Report test results and complete all job records in accordance with relevant standards, test specifications and workplace procedures

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Other 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.

Standards and codes include Australian or international standards and codes and may include one or more of:

- non-destructive testing of welds
- non-destructive testing of materials
- standards for materials used in manufacturing and engineering
- standards for calibration and operation of test equipment.

Reference standards include:

- purchased
- supplied by test equipment suppliers
- developed by the NDT technician.

Defects include one or more of the following:

- weld discontinuities and cracks
- corrosion
- metal fatigue
- deformation in nonferrous or ferrous alloys steels
- fatigue cracks
- stress corrosion cracking
- heat damage
- metal properties sorting
- manufacturing defects
- coating thickness measurement.

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Unit Mapping Information

No equivalent unit

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 MEM24016 Perform eddy current array tests

Modification History

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Performance Evidence

There must be evidence the candidate has demonstrated the ability to:

- review at least two eddy current array test specifications and identify:
 - relevant Australian and/or international standards
 - material test area
 - most appropriate eddy current array test technique and equipment
 - workplace access and WHS requirements for specified eddy current tests
- set up, calibrate and perform eddy current array tests to identify:
 - weld discontinuities and cracks
 - material conductivity
 - coating thickness
 - tube conformance to specifications
- interpret eddy current array test data from the above tests to identify:
 - material thickness
 - corrosion
 - discontinuities
 - conductivity
 - non-conductive coating thickness on coated metal plate and tube
- apply acceptance criteria to discontinuities and classify defects in accordance with national and international standards
- calculate the effect of probe lift on the amplitude and phase of test material
- prepare test reports in accordance with standards and test specifications and workplace procedures.

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

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- work health and safety (WHS) procedures and requirements in relation to eddy current array preparation and testing
- advantages of eddy current array testing over conventional eddy current testing

- limitations of eddy current array testing
- basic principles of electricity, magnetism, electromagnetism and eddy current testing including:
 - reactance – field made by eddy current
 - Biot-Savart law – definition, practical (right hand) rules
 - Amperes law – definition, applications (toroid, infinite coil, flat coil)
 - Lenz law – definition, auto-induction factor, mutual induction factor, coupling factor
 - induced currents – short circuit coil, metallic mass, skin effect and reactance
- materials that are suitable for eddy current array testing and their material properties
- cleaning and preparation processes for eddy current array testing equipment and test areas
- eddy current array equipment components and their function including components and controls for transmission, reception and data presentation
- types of eddy current array probes and their application including:
 - rigid and flexible surface
 - weld scan
 - rigid and flexible complex geometry
 - differential
 - absolute
 - reflection
 - bridge
- probe structure and operating principles and features including:
 - coil array
 - coil pattern (topology)
 - multiplexing
 - activation sequence
 - gain
 - frequency range
 - drift
- impact of test object phase and amplitude on eddy current array tests
- eddy current array test techniques for:
 - discontinuity testing in metal plate and pipe
 - metal thickness testing
 - conductivity measurement
 - testing the effects of heat treatment
 - determining non-conductive coating thickness over metal
- relationship between probe lift and material amplitude and phase
- processes to avoid coil mutual inductance
- types of discontinuities and their consequences
- classification and reporting of defects including:
 - corrosion

- metal fatigue
- deformation in nonferrous/ferrous alloys steels
- fatigue cracks
- stress corrosion cracking
- heat damage
- metal properties sorting
- manufacturing defects
- coating thickness measurement.
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Assessment Conditions

- Assessors must:
 - have vocational competency in undertaking eddy current array testing 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.
- There must be 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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