



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **MSL905001A Perform non-standard calibrations**

**Revision Number: 1**

## MSL905001A Perform non-standard calibrations

### Modification History

Not applicable.

### Unit Descriptor

<b>Unit descriptor</b>	This unit of competency covers the ability to recognise non-conforming calibration work, to research and select the most appropriate test method or calibration procedure for a given measurement request and then conduct the calibration. It also covers the ability to modify and revise existing procedures or substitute alternative instruments and measurement standards, when necessary.
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### Application of the Unit

<b>Application of the unit</b>	<p>This unit of competency is applicable to calibration technicians/specialists who carry out calibrations in first, second and third party laboratories, and laboratories where testing and/or calibration forms part of inspection or product certification. They work with limited guidance and results of their work are checked by the laboratory manager, quality inspector or designated signatory.</p> <p>The unit requires personnel to use a wide variety of precision measuring equipment and standards and cope with deviations from the explicit procedural instructions detailed in standard procedures and work instructions. When deviations do occur, each case must be documented, technically justified, authorised and accepted by the client.</p> <p>Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.</p>
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## Licensing/Regulatory Information

Not applicable.

## Pre-Requisites

<b>Prerequisite units</b>		
	<i>MSL904001A</i>	<i>Perform standard calibrations</i>

## Employability Skills Information

<b>Employability skills</b>	This unit contains employability skills.
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## 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.
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Select the appropriate calibration procedure	1.1. Identify non-conforming calibration tasks and requests and analyse their significance 1.2. Review the authorised procedure and establish whether it is appropriate for the test, if required 1.3. Research an alternative or adapt an existing procedure to satisfy the test specification requirements, if required 1.4. Confirm that available resources meet all the requirements of the calibration procedure 1.5. Obtain authorisation prior to substituting equipment, changing or deviating from the specified procedure 1.6. Document and validate any authorised changes or deviations in accordance with enterprise procedures
2. Prepare items for calibration	2.1. Identify hazards and use the appropriate personal protective equipment, safety equipment and procedures 2.2. Assemble and set up reference standards and associated equipment prior to testing 2.3. Verify performance of reference standards and measuring equipment prior to use and adjust or calibrate as necessary 2.4. Identify and minimise potential sources of measurement error
3. Perform calibration	3.1. Perform individual tests and document each step in the calibration procedure to ensure repeatability of measurement 3.2. Critically analyse readings to confirm they are the result of a valid measurement and record data as required (as-found or before adjustment) 3.3. Adjust device under test to bring readings within tolerance and record results (as-left or after adjustment) if required 3.4. Analyse resulting test data to detect trends or inconsistencies that would significantly affect the accuracy or validity of test results 3.5. Seek appropriate advice when result interpretation is outside authorised scope of approval
4. Document results	4.1. Document compliance/non-compliance with requirements of test and/or specifications 4.2. Estimate and document uncertainty of measurement

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
	<p>in accordance with enterprise procedures, if required</p> <p>4.3. Record the results of each test/calibration accurately, unambiguously and objectively</p> <p>4.4. Ensure confidentiality of enterprise information</p>
5. Finalise calibration	<p>5.1. Prepare and issue a final report for the job/item detailing testing carried out, statement of compliance and all other required information</p> <p>5.2. Report any non-compliance and verify next course of action with supervisor</p> <p>5.3. Attach calibration labels, equipment stickers, quality control tags and tamper resistant seals as required in enterprise procedures</p> <p>5.4. Report all changes and deviations that may have a significant influence on the test</p> <p>5.5. Store test equipment/measurement standards and results in accordance with enterprise procedures</p>

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

#### Required skills

Required skills include:

- operating a wide range of equipment correctly and safely in accordance with enterprise procedures
- identifying non-conforming calibration tasks and requests and assessing their significance
- researching current, alternative calibration methods and equipment
- quantifying the potential or actual impact of a wide range of test/environmental/equipment influences on data quality
- explaining complex calibration procedures to clients
- maintaining close attention to procedures, accuracy and precision of measurement to ensure integrity of test/calibration results
- critically examining each calibration step to ensure repeatability and validity of data
- preparing test/calibration documentation that is accurate and complies with requirements
- recognising opportunities for improvements to procedures

#### Required knowledge

Required knowledge includes:

- requirements for the competence of testing and calibration laboratories (e.g. AS ISO/IEC 17025) as they affect job role and responsibilities
- limits of authority and procedures for changing or deviating from standard calibration methods and procedures
- structure and terminology used in standard calibration methods, procedures, requests and instructions
- current calibration methods, procedures and technology applications used in the laboratory
- implications of changing or deviating from standard calibration procedures
- equipment specifications and limitations and the implications of equipment substitution
- hierarchy and appropriate selection of reference materials
- handling, transport, storage and operation of reference and working standards
- laboratory environmental control requirements
- calculation procedures to give results in appropriate accuracy, precision and units
- equipment and testing method troubleshooting procedures
- methods for statistical analysis (means, ranges and standard deviations) and

**REQUIRED SKILLS AND KNOWLEDGE**

estimation of uncertainty of measurement (may include the use of software)

- reporting procedures and legislative requirements
- enterprise and/or legal traceability requirements
- relevant health, safety and environmental requirements
- layout of the enterprise, divisions and laboratory
- organisational structure of the enterprise
- lines of communication
- role of laboratory services to the enterprise and customers

**Specific industry**

Additional knowledge requirements may apply for different industry sectors. For example, testing conducted in the following fields:

- acoustic and vibration measurement
- chemical testing
- construction materials testing
- electrical testing
- heat and temperature measurement
- mechanical testing
- metrology
- non-destructive testing
- optics and radiometry
- pressure testing

## Evidence Guide

<b>EVIDENCE GUIDE</b>	
<p>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.</p>	
<b>Overview of assessment</b>	
<b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b>	<p>Assessors should ensure that candidates can:</p> <ul style="list-style-type: none"> <li>• identify non-conforming calibration tasks and requests and assess their significance</li> <li>• research current, alternative calibration methods and equipment for a given request</li> <li>• quantify the potential or actual impact of a wide range of test/environmental/equipment influences on data quality</li> <li>• explain complex calibration procedures to clients and clarify requirements and deviations</li> <li>• maintain very close attention to procedures, accuracy and precision of measurement to ensure integrity of test/calibration results</li> <li>• critically examine each calibration step to ensure repeatability and validity of data</li> <li>• prepare test/calibration documentation that is accurate and complies with requirements</li> <li>• operate a wide range of equipment correctly and safely</li> <li>• apply all relevant enterprise procedures to ensure the quality and integrity of the services or data they provide</li> <li>• recognise opportunities for improvements to procedures.</li> </ul>
<b>Context of and specific resources for assessment</b>	<p>This unit of competency is to be assessed in the workplace or simulated workplace environment.</p> <p>This unit of competency may be assessed with:</p> <ul style="list-style-type: none"> <li>• <i>MSL925001A Analyse data and report results</i></li> <li>• <i>MSL925002A Analyse measurements and estimate uncertainties.</i></li> </ul> <p>Resources may include:</p> <ul style="list-style-type: none"> <li>• specialised calibration/test equipment, reference standards and materials and laboratory facilities</li> <li>• access to a library of calibration methods, procedures</li> </ul>



<b>EVIDENCE GUIDE</b>	
	<p>and equipment specifications</p> <ul style="list-style-type: none"> <li>• enterprise quality manual and procedures.</li> </ul>
<b>Method of assessment</b>	<p>The following assessment methods are suggested:</p> <ul style="list-style-type: none"> <li>• review of calibration results, uncertainty calculations and documentation completed by the candidate</li> <li>• feedback from supervisors and/or customers regarding quality of calibration services provided by the candidate</li> <li>• observation of the candidate conducting non-standard calibrations</li> <li>• oral or written questioning to check underpinning knowledge of non-standard calibration procedures.</li> </ul> <p>In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly.</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 and/or assessment support when required.</p> <p>The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.</p>
<b>This competency in practice</b>	<p>Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting.</p> <p><b>Background</b></p> <p>Calibration technicians/specialists have the skills and knowledge to operate, maintain and calibrate a wide variety of complex test equipment and measuring instruments with limited guidance. They must remain abreast of technical and equipment advances, interpret complex technical information accurately and liaise with clients to clarify their needs. They must demonstrate high levels of initiative and concentration when performing technically demanding measurements, providing solutions for non-conforming work and when adjusting</p>

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or repairing complex instruments. The calibration specialist's workload can be routine and repetitive. A perpetual back-log of work and the constant need to reduce turn-around-time to meet client demands coupled with enterprise productivity goals can induce stress and mental fatigue if not carefully managed. However, it is essential that personnel are able to perform tests and associated work tasks without undue pressure that might influence technical judgement if 'integrity of measurement' is to be retained.

**Calibration (1)**

A client has delivered a new model vibration transducer to the laboratory and would like a full test report on the item. A calibration technician assesses the job. They conclude that because the item is new to the industry, the laboratory will probably not have a documented calibration procedure. A quick ring around the company's other laboratories confirms that a procedure has not been written yet. They analyse the item's technical specifications and realise that although a generic procedure will suffice for most of the tests, it will have to be modified.

The technician reports these concerns to the supervisor who confirms that the client wants to know if the item meets the manufacturer's specifications. Approval is given to the technician to modify a previous procedure. The revised procedure is shown to the supervisor who checks each step and confirms the test is technically justified and all uncertainties have been calculated and documented.

The technician sets up the reference standards, confirms they are fully operational and within specification and begin the test. Each stage of the test is carefully monitored to ensure the data is correct and valid. On completion, another technician conducts the test and the data is compared. The supervisor is confident the test and data are valid and a report is generated, including a method validation summary for the laboratory's records.

**Calibration (2)**

A calibration technician is scheduled to calibrate a client's signal generator in accordance with the manufacturer's procedure. The technician reads the procedure and assembles all the required reference standards but notices the laboratory's reference frequency

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counter is not available because it has been sent away for calibration. The technician needs to substitute another instrument and so scans the other workbenches. They decide on a particular model and refer to the instrument's technical specifications to confirm that it has all the required ranges and is accurate enough. Convinced this item will do the job, the technician seeks and gains approval from the supervisor. There is no need to consult with the customer because the substitution will have no negative influence on the results. The technician completes the calibration in accordance with the procedure. In the final report, they document the details of the replacement equipment used in the test to ensure the repeatability of measurements and to comply with statutory regulations.

## Range Statement

### RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

#### Codes of practice

Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

#### Standards, codes, procedures and/or enterprise requirements

Standards, codes, procedures and/or enterprise requirements may include:

- Australian and international standards, such as:
  - AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
  - AS/NZS ISO 9001:2008 Quality management systems - Requirements
  - AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
  - AS/NZS ISO 10012:2004 Quality assurance requirements for measurement equipment
  - ISO 5725 Accuracy (trueness and precision) of measurement methods and results
  - ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
- Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
- material safety data sheets (MSDS)
- enterprise recording and reporting procedures and standard operating procedures (SOPs)
- quality manuals, equipment and operating/technical manuals
- test methods and calibration procedures (validated and authorised)
- test methods and calibration procedures

<b>RANGE STATEMENT</b>	
	<p>published by international, national or regional standards, reputable technical organisations, scientific texts or journals and equipment manufacturers</p> <ul style="list-style-type: none"> <li>• incident and accident/injury reports</li> <li>• schematics, workflows, laboratory layouts and production and laboratory schedules</li> </ul>
<b>Non-standard calibrations</b>	<p>Non-standard calibrations involve detecting and dealing with non-conforming work associated with the testing and/or calibrating of equipment, such as:</p> <ul style="list-style-type: none"> <li>• common test equipment, such as anemometers, balances, barometers, calipers, environmental chambers, hygrometers, manometers, masses, micrometers, pressure equipment, spectrophotometers, tape measures, rules, temperature (digital) indicating systems, thermometers, thermocouples, timing devices, vibration analysis equipment and weighing instruments</li> <li>• electrical reference standards, such as air-lines, analogue meters, attenuators, bridges-manual balance, capacitors, DC voltage references, digital instruments (calibrators, DMMs, electronic transfer standards), inductors, instrument and ratio transformers, instrument transformer test sets, potentiometers, resistors, radio frequency (RF) power meters, RF thermistor mounts and thermal converters, shunts, time interval and frequency standards, transfer standards AC-DC, voltage dividers, volt ratio boxes and watt-hour references</li> <li>• working standards, instruments and testing equipment, such as electromagnetic compatibility (EMC) test equipment, field strength meters, flammability test equipment, gauges/test fingers/test pins, hipot testers, impact hammers, impulse testers, instrument calibrators, network analysers, signal generators and spectrum and harmonic analysers</li> </ul>
<b>Hazards</b>	<p>Hazards may include:</p> <ul style="list-style-type: none"> <li>• electric shock</li> </ul>

<b>RANGE STATEMENT</b>	
	<ul style="list-style-type: none"> <li>• disturbance or interruption of services</li> <li>• manual handling of heavy equipment boxes</li> <li>• sources of electromagnetic radiation (lasers, RF generators/transmitters)</li> <li>• fluids under pressure</li> <li>• heat sources, such as ovens</li> </ul>
<b>Safety procedures</b>	<p>Safety procedures may include:</p> <ul style="list-style-type: none"> <li>• use of personal protective equipment, such as hearing protection, gloves, safety glasses and coveralls</li> <li>• ensuring access to service shut-off points</li> <li>• handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions and enterprise procedures and regulations</li> <li>• regular cleaning of equipment and work areas</li> </ul>
<b>Communication</b>	<p>Communication may be with:</p> <ul style="list-style-type: none"> <li>• supervisors and managers (laboratory, quality and customer service)</li> <li>• peers and other laboratory or relevant technical personnel</li> <li>• clients and end users of equipment</li> <li>• external auditors, or accreditation agency for example, National Association of Testing Authorities (NATA)</li> <li>• equipment manufacturers and suppliers of spare parts</li> </ul>
<b>Working environment</b>	<p>The working environment will have a controlled environment but could be a:</p> <ul style="list-style-type: none"> <li>• purpose-built designed facility</li> <li>• mobile facility in the field</li> </ul>
<b>Occupational health and safety (OHS) and environmental management requirements</b>	<p>OHS and environmental management requirements:</p> <ul style="list-style-type: none"> <li>• all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time</li> <li>• all operations assume the potentially hazardous</li> </ul>

**RANGE STATEMENT**

	<p>nature of samples and require standard precautions to be applied</p> <ul style="list-style-type: none"> <li>where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health</li> </ul>
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**Unit Sector(s)**

<b>Unit sector</b>	Calibration
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**Competency field**

<b>Competency field</b>	
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**Co-requisite units**

<b>Co-requisite units</b>		