



Australian Government

MSL925005 Analyse measurements and estimate uncertainties

Release: 1

MSL925005 Analyse measurements and estimate uncertainties

Modification History

Release 1. Supersedes and is not equivalent to MSL925003 Determine measurements of uncertainty. Prerequisite units added. Title changed. Minor change to Performance Evidence for clarity. Removal of duplicating (legal, ethical) or unnecessary (WHS) item in Knowledge Evidence.

Application

This unit of competency describes the skills and knowledge to use statistical analysis to estimate and report measurement uncertainty in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (or its replacement Standard). Personnel are required to review their estimates of measurement uncertainty to assist with making decisions on the fitness for purpose of the measurements.

This unit of competency applies to laboratory personnel who work in calibration and testing facilities, process and interpret data, and are required to determine uncertainties using standard methods. The rigour required in estimating uncertainty will depend on the required accuracy of the particular calibration, test or measurement.

No licensing or certification requirements exist at the time of publication. However, regulations and/or external accreditation requirements for laboratory operations exist, so local requirements should be checked. Relevant legislation, industry standards and codes of practice within Australia must also be applied.

Pre-requisite Unit

MSL924005 Process and interpret data

MSL925006 Analyse data and report results

Competency Field

Data

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. Identify the measured quantity and the uncertainty components	1.1 Specify an equation for the measurement 1.2 List uncertainty components that are associated with each input in

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	the equation
2. Determine the size of each uncertainty component	2.1 Calculate the standard deviations and standard deviation of the mean from the repeated measurement results 2.2 Use calibration reports, manufacturer's specifications, quality control and validation data, and experimental data to collect other available information on the uncertainty components 2.3 Assign degrees of freedom to each uncertainty component
3. Reduce each uncertainty component to a standard uncertainty	3.1 Allocate an appropriate distribution for each uncertainty component 3.2 Calculate the standard uncertainties
4. Calculate an expanded uncertainty to the required confidence level	4.1 Calculate the sensitivity coefficient for each uncertainty component and multiply each standard uncertainty by its sensitivity coefficient and ensure they are all expressed in the unit of the output 4.2 Calculate a combined standard uncertainty 4.3 Determine an appropriate coverage factor based on the estimated effective degrees of freedom 4.4 Calculate the expanded uncertainty
5. Report the expanded uncertainty	5.1 Report the measurement result and uncertainty to an appropriate number of significant figures 5.2 Report the confidence level and coverage factor 5.3 Determine the appropriateness of the size of the expanded uncertainty relative to the tolerance or required accuracy of the test 5.4 Determine the fitness for purpose of the expanded uncertainty relative to the use of the measurement result

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.

Unit Mapping Information

No equivalent unit.

Links

MSL Laboratory Operations Companion Volume Implementation Guide is available from VETNet – -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=5c63a03b-4a6b-4ae5-9560-1e3c5f462baa>

Assessment Requirements for MSL925005 Analyse measurements and estimate uncertainties

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Performance Evidence

There must be evidence the candidate has completed the tasks outlined in the elements and performance criteria of this unit, and:

- analysed measurements and estimated uncertainties including each of the following at least once across 3 data sets:
 - developing and using a measurement model
 - using statistical analysis to estimate and report measurement uncertainty in accordance with the *ISO Guide to the Expression of Uncertainty in Measurement*
 - calculating a combined standard uncertainty using root-sum-of-squares, accounting for correlations where necessary
 - gathering information about uncertainty components from calibration reports or reference material report
 - calculating sensitivity coefficients either mathematically, numerically or experimentally
 - reporting results and uncertainties in the required formats
 - organising and maintaining all sources of uncertainty and the associated data in the uncertainty-analysis table
 - using the uncertainty-analysis table to identify the largest uncertainty.

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- steps in the measurement, test or calibration involved
- difference between errors, corrections and uncertainties
- uncertainty in the uncertainty estimation process
- uncertainty components, including:
 - calibration uncertainty
 - instability or drift in the calibrated instrument
 - repeatability of the results
 - resolution or readability of the instrument
 - environmental influences

- reference material uncertainty
- factors arising from the instrument being used under different conditions to those when it was calibrated
- factors arising from using an instrument under a different operating environment or procedures
- reproducibility of quality control data and when this is applicable
- workplace procedures for:
 - determining the uncertainty components associated with each of the inputs and whether they are significant and for applying appropriate corrections
 - determining uncertainty components from quality control data
- manufacturer's specifications (including instrument drift specification and reference materials)
- concept of degrees of freedom
- characteristics of a valid measurement
- the role of measurement uncertainty in conformity assessment
- reporting requirements: the uncertainty in measurement (GUM), National Association of Testing Authorities (NATA) or other applicable reference material
- Australian and international standards, codes and guides as they relate to the job role.
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Assessment Conditions

Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions and contingencies. The following conditions must be met for this unit:

- use of suitable facilities, equipment and resources, including:
 - data sets and records
 - test methods and description of test set-up
 - computer and relevant software or laboratory information management system
 - workplace procedures.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors.

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