



Australian Government

**Assessment Requirements for MSL925002
Analyse measurements and estimate
uncertainties**

Release: 1

Assessment Requirements for MSL925002 Analyse measurements and estimate uncertainties

Modification History

Release 1. Supersedes and is equivalent to MSL925002A Analyse measurements and estimate uncertainties

Performance Evidence

Evidence of competence in this unit must satisfy all of the requirements of the elements and performance criteria, and include demonstration of:

- using scientific notation, correct units and correct number of significant figures
- evaluating formulae containing powers, exponents and logarithms functions
- preparing and interpreting linear graphs
- using statistical analysis to estimate and report measurement uncertainty in accordance with the *ISO Guide to the Expression of Uncertainty in Measurement*
- preparing a fully documented, realistic uncertainty budget that is appropriate for the application
- 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 experimentally or by partial differentiation
- calculating expanded uncertainty
- using spreadsheets to calculate uncertainties
- deciding if the uncertainty is suitable for the accuracy required for the test and establishing whether it is fit for purpose using the tolerance to uncertainty ratio (TUR)
- using and interpreting mean, standard deviation, standard deviation of the mean, degrees of freedom, histograms and frequency plots, probability, normal probability plots and control charts
- using the student's t-table to get a coverage factor for a particular level of confidence
- using and interpreting significance tests, such as t-test, f-test and analysis of variance (ANOVA), variances, standard deviation of prediction and linear regression
- using regression methods for calibration, linearity checks and comparing analytical methods
- using and interpreting normal, rectangular, triangular distributions and the factors used to reduce each to a standard uncertainty
- allocating degrees of freedom to each uncertainty component using the Welch-Satterthwaite equation
- reporting results and uncertainties in the required formats.

Knowledge Evidence

Must provide evidence that demonstrates knowledge of:

- the steps in the measurement, test or calibration involved
- the difference between errors, corrections and uncertainties
- uncertainty in the uncertainty estimation process
- uncertainty components that are common to the use of an instrument
- uncertainty components that arise due to the instrument being used under different conditions to those when it was calibrated
- uncertainty components, such as:
 - calibration uncertainty
 - instability or drift in the calibrated instrument
 - repeatability of the results
 - resolution or readability of the instrument
 - environmental influences, such as temperature, air pressure, humidity, vibration, electrical noise and gravity
 - reference material uncertainty
 - factors arising from using an instrument under a different operating environment or procedures (e.g. orientation of a transducer and immersion depth of a temperature probe)
 - reproducibility of quality control data
- procedures for determining the uncertainty components associated with each of the inputs and whether they are significant and for applying appropriate corrections
- manufacturer's specifications (e.g. instrument drift specification and reference materials)
- procedures for determining uncertainty components from quality control data
- the concept of degrees of freedom
- the characteristics of a valid measurement
- reporting requirements, such as the uncertainty in measurement (GUM), National Association of Testing Authorities (NATA) or other applicable reference material
- confidence levels required by the National Measurement Act 1960 (e.g. 95% for most applications, but others may require a higher confidence level).

Assessment Conditions

- Judgement of competence must be based on holistic assessment of the evidence. Assessment methods must confirm consistency of performance over time, rather than a single assessment event.
- This unit of competency is to be assessed in the workplace or a simulated workplace environment. A simulated workplace environment must reflect realistic operational workplace conditions that cover all aspects of workplace performance, including the environment, task skills, task management skills, contingency management skills and job role environment skills.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.

- 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.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept in each case).
- This unit of competency may be assessed with:
 - MSL904001 Perform standard calibrations
 - MSL905001 Perform non-standard calibrations
- Holistic assessment methods include:
 - review of data worksheets, calculations, spreadsheets, databases, statistical analysis, graphs and/or tables prepared by the candidate
 - questions to assess understanding of relevant procedures, trends in data and sources of uncertainty
 - review of reports and records prepared by the candidate
 - feedback from supervisors and peers regarding the candidate's ability to estimate uncertainty in accordance with workplace procedures.
- Access is required to all instruments, equipment, materials, workplace documentation, procedures and specifications associated with this unit, including, but not limited to:
 - data sets and records
 - test methods and description of test set-up
 - computer and relevant software or laboratory information system
 - workplace procedures.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- The assessor must demonstrate both technical competency and currency.
- Technical competence can be demonstrated through:
 - relevant VET or other qualification/Statement of Attainment AND/OR
 - relevant workplace experience.
- Currency can be demonstrated through:
 - performing the competency being assessed as part of current employment OR
 - having consulted with a laboratory about performing the competency being assessed within the last twelve months.

Links

Companion Volume implementation guides are found in VETNet -

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