GENERAL INFORMATION ON MEASUREMENT UNCERTAINTY

For those relying on test results to make informed decisions and judgements.

Measurement Uncertainty

Many important business decisions are based on the results obtained from quantitative testing. It is important that an indication of the quality of laboratory test results reported is available to you.

Results of tests cannot be perfect and the term measurement uncertainty is used to describe this lack of perfection. IANZ accredited laboratories are required to have a measure of the confidence placed on each result to demonstrate its fitness for your purpose.

Measurement uncertainty is a vital part of the test result that gives this information, and one that is used internationally.

The Testing Process

Inherent imperfections in each step of the testing process, from sampling to the final measurement, cause variability in the results of the tests.

IANZ accredited laboratories make measurements and perform controls regularly to ensure that this overall variability is small enough for the end result to be appropriate for your requirements.

Results should be fit for the intended purpose

If the uncertainty of a test result is too large, you will not be able to make a reliable decision. If it is smaller than you require, the test may be unnecessarily complex and costly. Test result uncertainties should be fit for the intended purpose.

If you are unsure as to what level of uncertainty you need, do not hesitate to contact the laboratory.

What it could look like

In the test result you receive, you will be given the normal information about what has been measured and the units of measurement.

When a test result is presented as a measured value and a measurement uncertainty, it prescribes an interval within which the true value of the quantity being measured is expected to lie with a stated level of confidence (usually 95%). This uncertainty interval varies in size, depending on the test.

Uncertainty Interval
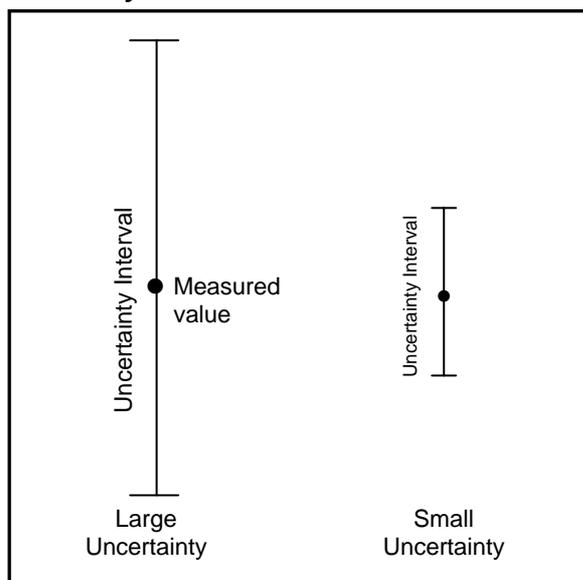
Example
The laboratory has found the lead content of a sample is 1.65 ± 0.15 mg kg $^{-1}$. This means that the true value of the quantity being measured is expected to be between 1.50 and 1.80 with (usually) 95% confidence.

Example Report
Total lead content (Pb):   1.65 mg kg $^{-1}$
Measurement Uncertainty: ± 0.15 mg kg $^{-1}$
The stated uncertainty is an expanded
measurement uncertainty for a 95% level of confidence (standard deviation x2).

It will be easier to compare results

Most laboratories have until now chosen not to state measurement uncertainty in their test reports. Instead, such information has been given only when the customer has asked for it.

In the future, information about the measurement uncertainty may appear more frequently in IANZ accredited test reports. It is also possible that you will come across new and unfamiliar quality terms. This is because there are new international guides and standards describing uncertainty.

Sampling

You may be wishing to have information on specific characteristics of a larger bulk of material from which a test sample was taken.
The material may not be homogeneous.

The uncertainty of the reported test result will usually not include variations associated with lack of homogeneity of the bulk material. Often variations across the bulk of material will be very much greater than the test result uncertainty.

If you require information about bulk material variations, the laboratory will need to design the sampling plan to make the necessary estimates.

Uncertainty and Product Specification Values

Many tests are done to assure you that a characteristic of a product does not exceed a regulatory or customer specification value. Without information about the measurement uncertainty, it may appear to be easy to make compliance decisions but these decisions may be unreliable.

There will be costs involved when rejecting product that should have been accepted. There may be judicial, medical, safety or trade consequences of accepting product or results that should have been rejected.

Ask the laboratory how confident they are that the test item passed or failed the product specification.

Example of applying the confidence interval to test results
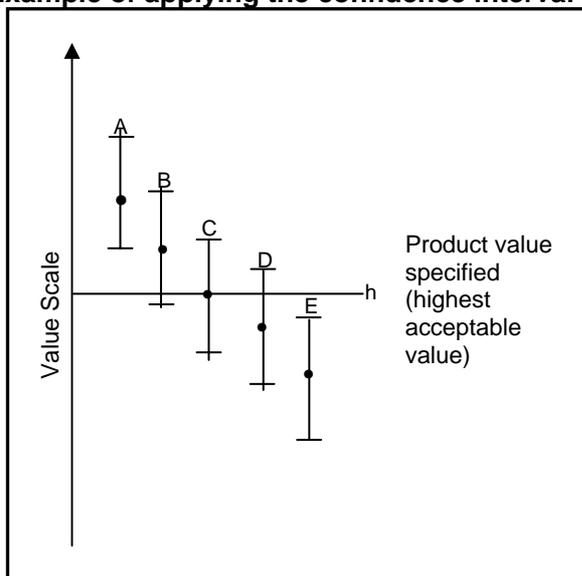
Test result A indicates there is more than 95% confidence that the product failed the specification.

Test result E at 95% confidence indicates an acceptable product.

For test results B, C and D, it cannot be said with 95% confidence whether the product passed or failed.

More Information

The laboratory has experts ready to advise on all matters regarding sampling, test methods and uncertainty. Please talk with them about your particular tests and how to correctly interpret the results.