[Organization logo]

[Organization name]

Commented [170251]: All fields in this document marked by square brackets [ ] must be filled in.

EVALUATION OF MEASUREMENT UNCERTAINTY PROCEDURE

Code:	
Version:	0.1
Created by:	
Approved by:	
Date of version:	
Signature:	

Commented [170252]: Adapt to the organization's practice for document and record control.

Distribution List for Paper-based Documents

Commented [17A3]: This is only necessary if document is in paper form; otherwise, this table should be deleted.

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				Date	Signature

Change History

Date	Version	Created by	Description of change
	0.1	17025Academy	Basic document outline

Table of Contents

1. Purpose, Scope and Users

The purpose of this procedure is to define the steps in [organization name] required to plan, measure and calculate the data required for an evaluation of measurement uncertainty program. This procedure lays down the basic first steps required for the program and references the recommended resources for completing the required calculations.

This procedure applies to all tests and calibrations where the known uncertainty of measurement is required or desired.

Users of this procedure are internal customers who use this information to gauge the accuracy and performance of the tests and calibrations they perform and external customers who need the information produced by this procedure to make decisions related to critical measurements.

2. References

- ISO/IEC 17025:2017 clause 7.6
- ISO/IEC Guide 98-3
- ISO/IEC guide 98-4
- JCGM 200:2012
- EA-4/02: Expression of the Uncertainty of Measurement in Calibration
- Quality Manual

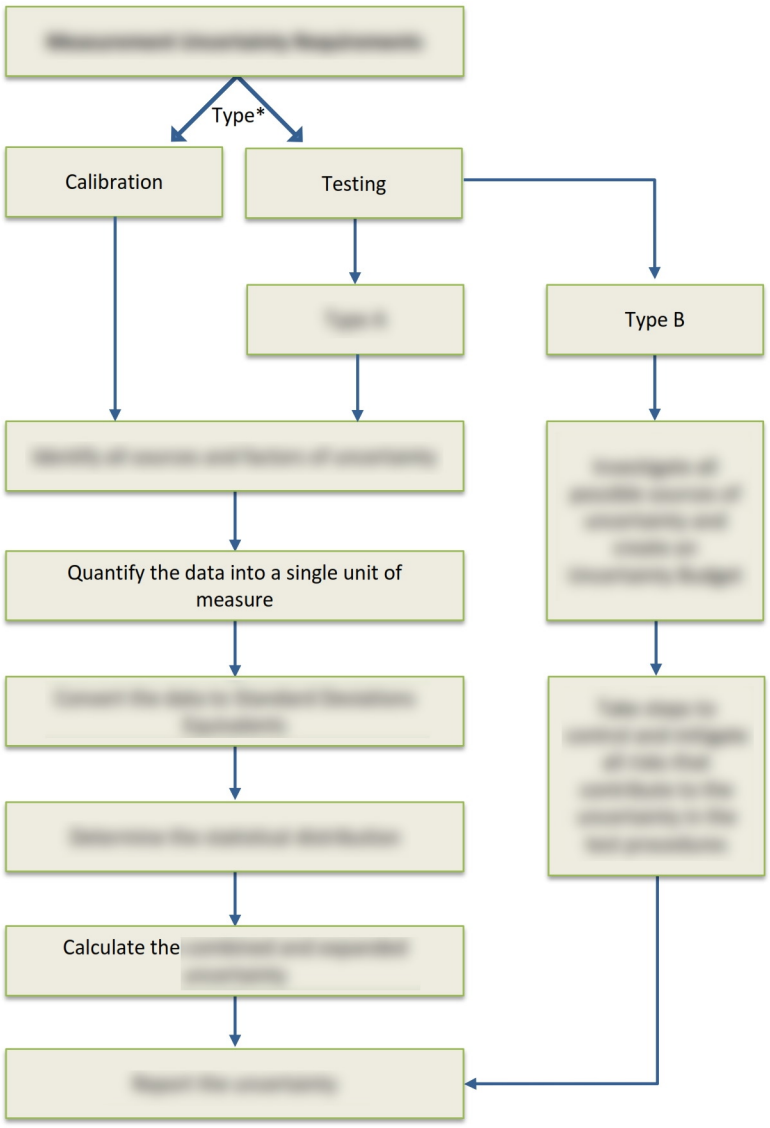
Commented [170254]: ISO/IEC Guide 98-3:2008 is a reissue of the 1995 version of the Guide to the Expression of Uncertainty in Measurement (GUM), with minor corrections.

Commented [170255]: ISO/IEC Guide 98-4:2012 Role of measurement uncertainty in conformity assessment - provides guidance and procedures for assessing the conformity of an item.

Commented [170256]: International vocabulary of metrology – Basic and general concepts and associated terms (VIM).

Commented [17A7]: You will find this document in the ISO 17025 Toolkit folder "03_Quality_Manual".

3. Flow Chart



4. Procedure

4.1. Measurement Uncertainty Requirements

All calibrations performed by the laboratory of [organization name] (including calibrations performed

Commented [170258]: Calibrations, for internal calibrations and outside calibrations, must contain an Uncertainty Measurement calculation.

For all tests performed by the laboratory, [job title] attempts to identify all components of uncertainty, make a reasonable estimation of the uncertainty and define the method by which it

Commented [170259]: Management must ensure this is done. An Engineer or Statistician may actually do this procedure, with coordination of Quality manager.

It is the responsibility of [job title] to ensure that uncertainties are calculated for all calibrations,

Commented [1702510]: Quality manager or person designated by Quality manager.

[Job title] must classify all sources of uncertainty to its evaluation methods and must prepare an

Commented [1702511]: Quality manager or Laboratory manager.

4.2. Factors in Measurement Uncertainty

[Job title] must first identify all factors that may lead to measurement uncertainty within the laboratory.

Commented [1702512]: An Engineer or Statistician with coordination of Quality manager.

measurement. Some but not all possible examples are:

Commented [1702513]: Each of these possible factors could produce variable data for calculation.

- Sampling
-
-
-
-
-
-
-
- Definition of the measurand

4.3. Type A and type B uncertainty components

Commented [1702514]: An Engineer or Statistician with coordination of Quality manager.

used. Type A being hard numbers and Type B taking into consideration all sources of uncertainty including attribute data.

Type A

Type A is the evaluation of a component of measurement uncertainty by a statistical analysis of measured quantity values, obtained under defined measurement conditions.

- Arithmetic Mean
- Standard Deviation
- Degrees of Freedom

Type B

Type B is the evaluation of a component of measurement uncertainty determined by means other than Type A evaluation of measurement uncertainty.

- Calibration reports
- Proficiency testing reports
- Manufacturer's manuals
- Standard methods
- White papers
- Journal articles
- Conference papers
- Textbooks
- Industry guides
- Data sheets

[Job title] assures that when only non-numeric components or results of pass/fail tests are used then those non-numeric factors must be investigated and controls must be placed on them in order to mitigate and reduce the uncertainty of test results.

4.4. Determine contributing factors and quantify

From the Type A and Type B lists of possible uncertainty sources, [job title] identifies the factors that are most relevant and important to tests and calibrations in the laboratory of [organization name]. If additional sources of uncertainty are possible, [job title] determines which applies.

All inputs must be measurable and quantified. Type A factors are almost always measurable. Type B factors must be converted to a measurable unit.

Only one measurand is used in the calculation of the measurement uncertainty, i.e. amps, grams, meters, volts, temperature, inches, ounces. Each factor must be represented in the same unit of measure.

4.5. Convert Uncertainty Components to Standard Deviation Equivalents

Commented [1702515]: Type B components can and sometimes do result in a simple Cause and Effect Diagram.

Commented [1702516]: Show evidence that uncertainty factors are being controlled when necessary. Controls can include special instructions, control plans and corrective actions.

Commented [1702517]: An Engineer or Statistician with coordination of Quality manager.

Commented [1702518]: See the references in paragraph 2 above additional sources.

Commented [1702519]: Never try to mix different inputs together. Create a separate document if necessary.

After taking a representative number of sample measurements, [job title] converts the readings from [illegible]

4.6. Determine the type of statistical distribution

When determining the type of statistical distribution, the factors fall into:

- Normal Distribution: Bell curve.
- [illegible]
- [illegible]
- [illegible]

4.7. Calculate the combined standard uncertainty and expanded uncertainty

Using commercially created software or a spreadsheet template, [job title] feeds the information [illegible] as an example.

5. Uncertainty Reporting

Where Calibration is part of the organization's Scope of Accreditation, the smallest uncertainty that [illegible]

[illegible]

We use the Measurement Uncertainty Report to record measurement uncertainties for internal purposes.

All calibration certificates must show the measurement uncertainty value for the calibration.

6. Managing Records Kept on the Basis of this Document

Record name	Code	Storage		Responsibility
		Retention time	Location	

Commented [1702520]: Both free and commercial programs are available. Many of the free programs work as well as the commercial ones.

Commented [1702521]: An Engineer or Statistician may actually do this procedure, with coordination of Quality manager.

Commented [1702522]: Estimations of Measurement Uncertainty must appear on your Scope of Accreditation and on all Calibration Certificates issued.

Commented [1702523]: These are activities that laboratory [illegible]

Commented [1702524]: Internal calibrations require a measurement uncertainty value to validate the calibration.

Commented [1702525]: If the record is in electronic form, write the name of the folder on Laboratory Manager's computer.

Commented [1702526]: Completed checklist is associated with a test or calibration and is kept with other records of that work for the same period of time those records are kept.

Measurement Uncertainty Checklist	PR.15.1	7 years	[office of [job title]]	[job title]
Measurement Uncertainty Record	PR. 15.2	7 years	[office of [job title]]	[job title]

Commented [1702527]: Laboratory or quality manager.

7. Appendices

- Appendix 1 – Measurement Uncertainty Checklist
- Appendix 2 – Measurement Uncertainty Record