

World Metrology Day

Measurements for Global Trade

20 May, 2020



Newell

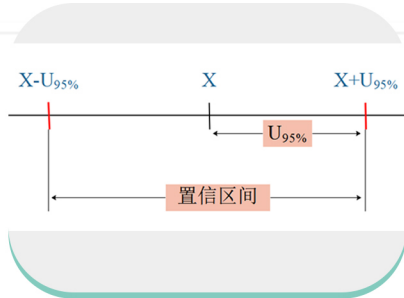
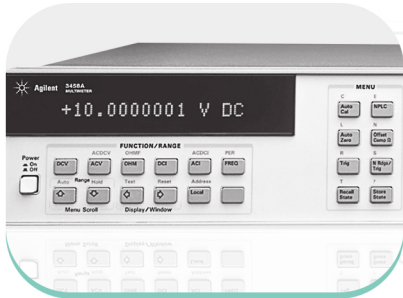
The truth builds trust.

CALIBRATION

See the Difference



Calibration Certificate



High-level Standards

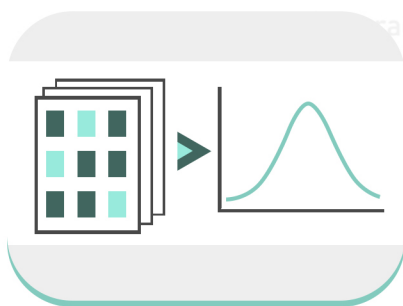
We have high-level standards and meters including Fluke 5522A, A40B, Agilent 3458A and etc.

Uncertainty Budget

Foundamental and complete uncertainty budget was applied for calibration process.

Auto Calibration Software

NWCali can adjust or perform calibration on battery tester channels.



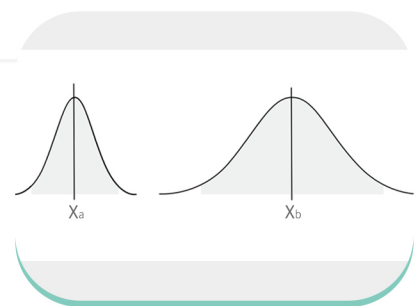
Smart Analysis

Calibration module of NSAP provides calibration data analysis and asset management.



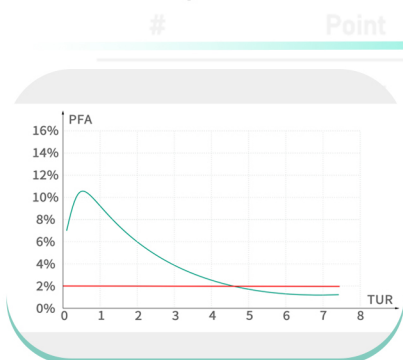
International Standards

We comply ISO/IEC 17025, Z540.3 and other international regulations.



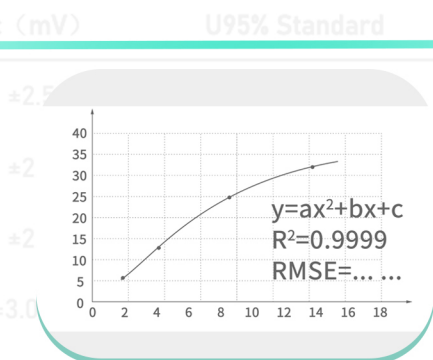
TUR

TUR analysis secures the reliability of calibration, and makes available to the further analysis.



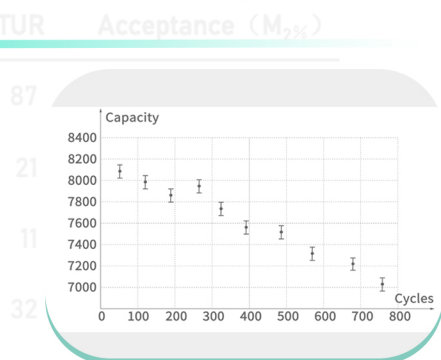
Guardband

Use different guardband strategies to satisfy different scenarios.



Re-fit from Calibration

Re-fit adjustment functions on command and measurement from calibration data on the cloud.

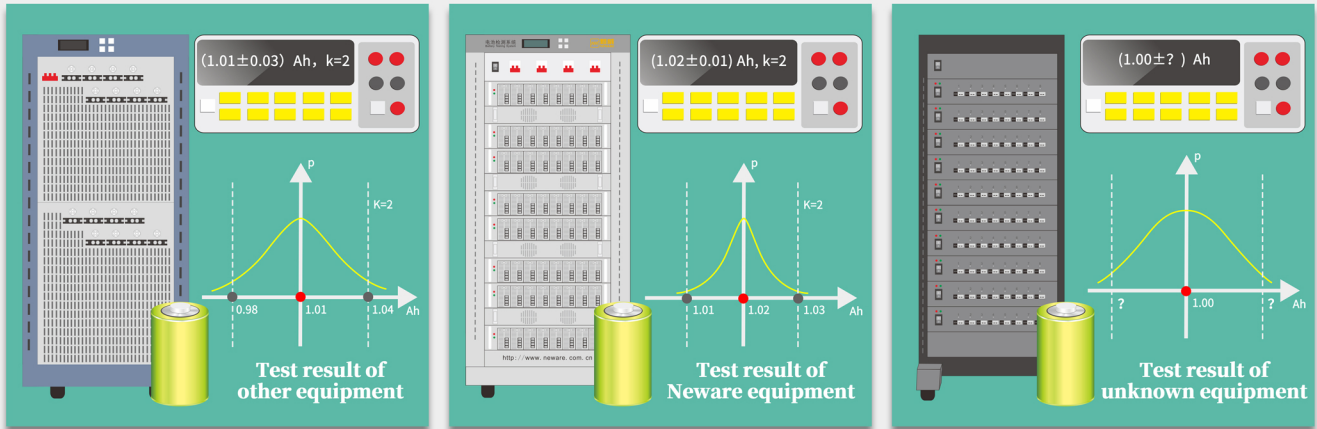


Data Utilization

Apply calibration and stability data on battery test data analysis.

The Basic Knowledge of Calibration

Measurement Uncertainty



When reporting the result of a measurement of a physical quantity, it is obligatory that some quantitative indication of the quality of the result be given so that those who use it can assess its reliability.

—*International vocabulary of metrology - Basic and general concepts and associated terms*

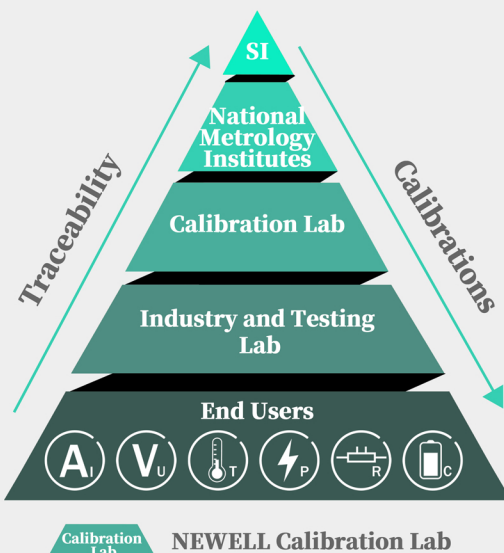
Calibration and Adjustment

Calibration: Operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication.

Adjustment: Set of operations carried out on a measuring system so that it provides prescribed indications corresponding to given values of a quantity to be measured. Adjustment of a measuring system should not be confused with calibration of a measuring system.

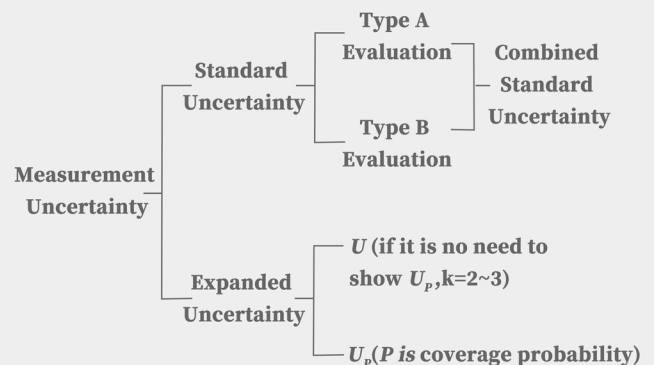
—*International vocabulary of metrology - Basic and general concepts and associated terms*

Traceability Pyramid



Evaluation of Uncertainty

The evaluation of uncertainty mainly refers to GUM or MCM.



GUM Method

The Tips of Calibration

Basic Concepts



Accuracy

How close a measurement reading is to the 'true' value of the parameter being measured.



Resolution

The level of discrimination that the measuring equipment can show; the smallest unit change that it can discern or detect.



Precision

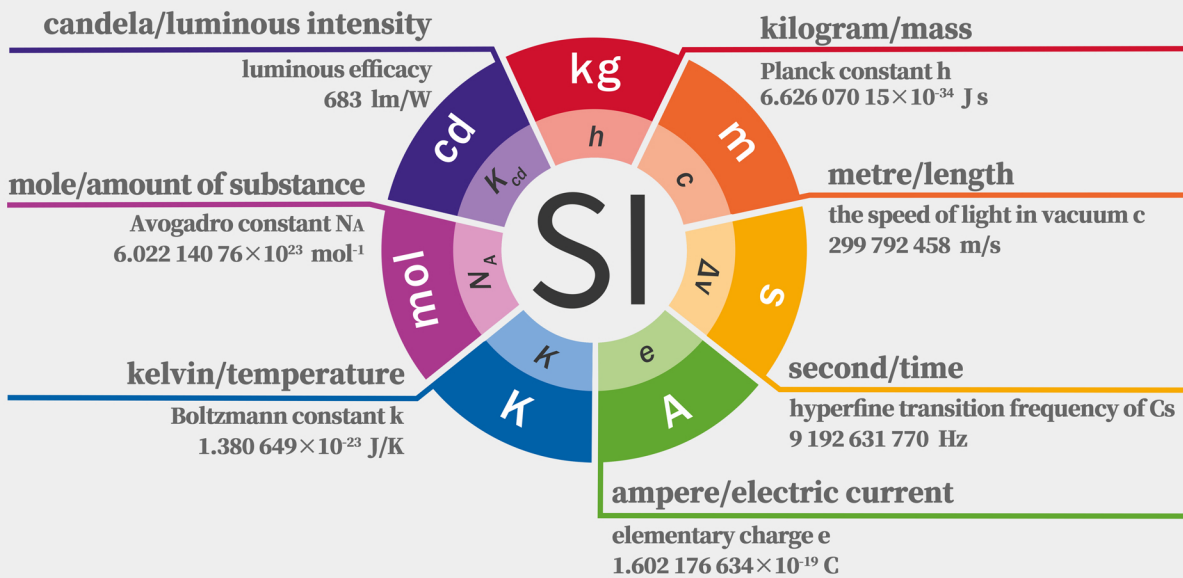
How repeatable or closely-grouped the measurement readings are.



Stability

The tendency of a measuring equipment not to 'drift' or degrade over time and usage.

Definition of the SI



The resolution on SI basic unit reform adopted by the 26th International Conference on Metrology (CGPM) came into effect on May 20, 2019.

SI Derived Units

$$V = \frac{W}{A} = \frac{J}{s \cdot A} = \frac{N \cdot m}{s \cdot A} = \frac{m \cdot m \cdot kg}{s \cdot s^2 \cdot A} = \frac{m^2 \cdot kg}{s^3 \cdot A}$$

$$\Omega = \frac{V}{A} = \frac{m^2 \cdot kg}{s^3 \cdot A \cdot A} = \frac{m^2 \cdot kg}{s^3 \cdot A^2}$$

Uncertainty Transfer

$$\begin{aligned} u_c^2(I) &= \sum_{i=1}^N \left[\frac{\partial y}{\partial x_i} \times u(x_i) \right]^2 \\ &= \left[\frac{\partial I}{\partial V} \times u(V) \right]^2 + \left[\frac{\partial I}{\partial R} \times u(R) \right]^2 \\ &= \left[\frac{1}{R} \times u(V) \right]^2 + \left[-\frac{V}{R^2} \times u(R) \right]^2 \\ &= I^2 \left[\left(\frac{u(V)}{V} \right)^2 + \left(-\frac{u(R)}{R} \right)^2 \right] \end{aligned}$$

Join us today in saluting all metrologists
who make our world a more accurate and
predictable place to live

