

## What is calibration?

Calibration is the recording and documentation of the deviation of a measuring instrument in comparison to another, traceable instrument with a higher accuracy, under prescribed conditions. This instrument is described as the standard.

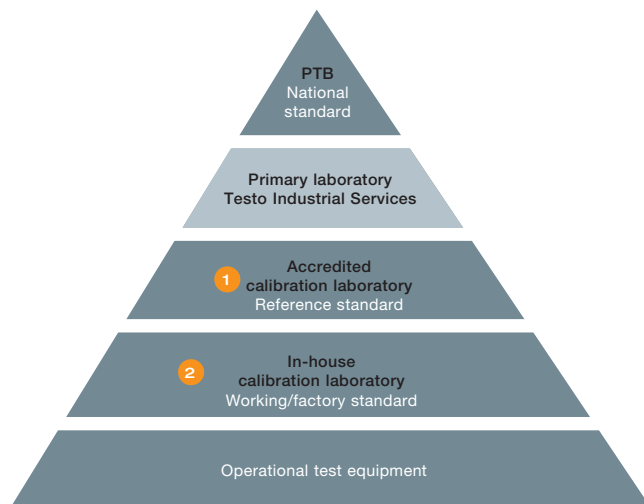
## What is adjustment?

Adjustment is the setting of a measurement value to the smallest possible deviation from the correct value. In adjustment, an interference with the instrument is necessary.

## Standards and traceability

**Normal:** Material measure, measuring instrument, reference material or measuring equipment with the purpose of specifying, embodying, maintaining or reproducing a unit or one or more parameter values.

**Metrological traceability** The property of a measurement result or the measurement value of a standard to be traceable to suitable standards – as a rule international or national standards, by an uninterrupted chain of comparative measurements with given measurement uncertainties.



### 1 Reference standard:

The standard, usually with the highest available accuracy at an observed point or in an organisation, from which measurements are derived.

### 2 Working/factory standard:

Routinely used standard for the calibration/testing of material measures, measuring instruments or reference materials. A working standard is usually calibrated with the aid of a reference standard.

## ISO certificates (factory certificates)



ISO calibrations are used in all areas in which test device monitoring and calibration are required but DAkkS calibrations are not. They satisfy the requirements of:

- ISO 9001:2015
- ISO 10012-2003
- ISO 9001:2008
- CFR
- ISO 13485
- HACCP/ LMHV
- VDA
- GMP

## Accredited calibration certificates

E.g.: DAkkS (D), Accreditation Austria (ÖKD, A), SCS (CH), UKAS (GB), NVLAP (US)

Accredited calibration certificates may only be issued by calibration and test laboratories whose expertise to carry out calibrations according to DIN EN ISO/IEC 17025 has been recognized. The calibration results achieved in these laboratories are the most highly reliable - after those of the state institutions (in Germany the PTB) - and are binding in courts. International conventions and DIN EN ISO/IEC 17025, the globally applicable accreditation basis, ensure that they are recognized and valid internationally.

DAkkS calibration certificates are the ideal solution for all users of measuring instruments who require a particularly high degree of safety, accuracy and reliability. Test equipment in the following sectors is often covered by DAkkS certificates:

- Factory and working standards
- Medical technology
- Expert assessors
- IATF 16949-certified companies
- Pharmaceuticals
- Approval and certification bodies
- Testing laboratories
- Accredited test and calibration laboratories

## Calibration interval

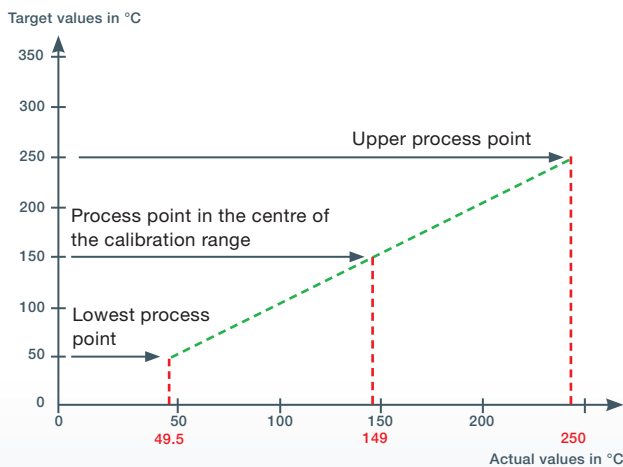
In order to achieve correct measurements in the long term, and to trust the required test equipment, it must be calibrated at regular intervals. These intervals from one calibration to the next are known as the calibration interval or monitoring interval. The length of this period can be individually determined by the user, and depends, for example, on:

- Recommendation of calibration laboratories (normally yearly)
- Specifications of the measuring instrument manufacturer
- Required measurement uncertainties
- Specifications of standards and guidelines
- Specifications of third parties
- Operating conditions of test equipment
- Frequency of use

## Calibration points

Enough calibration points should always be chosen so that reliable statements can be made on the measurement behaviour and the working range of the instrument. The calibration points should be close to the working range of the test equipment.

**Example: Temperature calibration:** Three calibration points distributed across the entire area of use. If a temperature probe is monitoring a temperature control process in the range of 50 to 250 °C, the following three calibration points can be selected.



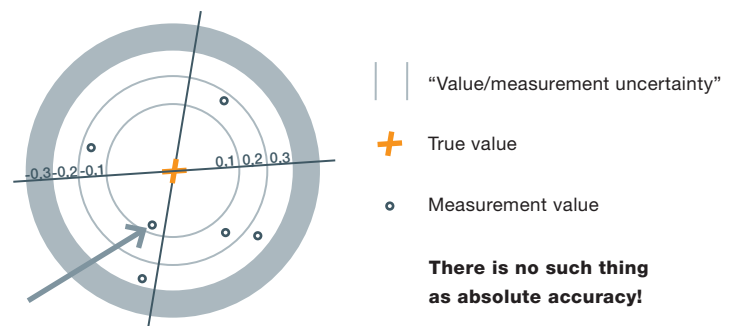
## Measurement uncertainty

A parameter associated with the result of a measurement, which characterises the dispersion of values which could be attributed to the measurement parameter, or: The estimated value for characterizing a range of values, within which the true value of the measurement parameter lies. There are many factors which influence the measurement uncertainty.

It is assumed that the measurement result is the best estimate for the value of the measurement parameter, and that all components of the uncertainty contribute to the dispersion – including those which derive from systematic influences, e.g. such as those deriving from corrections and reference standards.

On this topic, see: Guide to the expression of uncertainty in measurement (GUM).

The “dartboard explanation”:



In a game of darts, you will never hit the exact centre. Occasionally the dart finds its way to the bullseye, but very often you hit the board around it. The darts which have not gone into the bullseye represent the uncertainty in throwing i.e. the uncertainty of the darts player.

The measurement uncertainty is influenced by the calibration object, the measurement equipment, the persons, the measurement method and the ambient conditions.



### Calibration with Testo – your advantages at a glance:

- Avoidance of rejects and rectification work
- Fulfilment of norms, guidelines and standards
- Protection from potential compensation claims
- Audit security



### Testo – your partner for calibration

#### Calibration of your measuring instruments in accredited laboratories

- Secure measurement results thanks to highly accurate calibration – traceable to national or international standards
- Depending on your requirements, you receive accredited or ISO calibrations
- Benefit from 60 years of experience in measurement technology and calibration

We look forward to your questions and are happy to advise you individually:

[www.testo.com](http://www.testo.com)