

Implement Calibration and Certification Accreditation for a Competitive Advantage

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While the demand for high-quality products is increasing dramatically, another demand is simultaneously growing — the verification of accuracy. In such industries as automotive, aerospace and medical, small variations may have a large impact on results. In these segments, verifiable measurements and traceable accuracy become increasingly necessary. Verifiable temperature measurements, for example, are prompting greater numbers of thermometer suppliers to calibrate and certify their products to prove accuracy and provide traceability, and do so within a quality management system.

Accredited certification increases customer confidence in the performance of the instrument under test and customer confidence in the accredited certification carried out. It can also allow the measurement taken to be corrected — improving the accuracy beyond that specified.

The use of correctly calibrated high-accuracy temperature measurement instruments enables tighter manufacturing tolerances, enhanced product quality and ultimately, lower production costs. Some would argue that it is possible to achieve this level of quality by using experienced operators, which can be true. However, attaining high-accuracy, necessary production speeds, product quality and production yields should not depend on who the operator is on a given day, or even their continued employment.

Repeatability of measurement is possibly the single most important factor for the customer, regular calibration enables the customer to detect drift and plan recalibration frequency accordingly.

By implementing proven procedures that are backed by certified and calibrated instrumentation, companies distance themselves from their competition, and are in a better position to win contracts. Most are very familiar with the concept of calibration. Certification, however, goes an important step further by offering customers a verified, documented and tightly controlled demonstration of traceability they increasingly require.

Certification and Calibration.

Calibration is a familiar concept that implies adjustment or performance within defined tolerance. Certification of an instrument, though, is often beyond an organization's grasp as to why it is so important, and exactly how it is accomplished.

Calibration is used to ensure that an instrument complies with its claimed accuracy and repeatability figures. For instance, a manufacturer indicates an accuracy for a device that falls within 1% of its rating. Calibration involves adjusting the device until it reads and meets its published specification.

In comparison, certification measures the performance of an instrument against standards that are demonstrably traceable back to international standards, and takes place at an accredited laboratory. This traceability is achieved by taking an end-use thermometer,

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having it certified at an accredited facility. The accredited facility's standards have been calibrated at a national laboratory that participates in ITS90. Simply put certification requires that an instrument be measured against another instrument that precisely meets the required standards and that the standards are universal nationally. In this case, the specification serves only as an indication of operational functionality, as the performance is independently verified through certification. The benefit to the end user begins with the ability to ensure accuracy and repeatability, but it expands substantially from there.

During the past decade, there has been a marked increase in demand for quality and proof of quality and, as a result, the availability of accredited laboratories that are conveniently geographically located is in demand.

Accredited Laboratories

Laboratory accreditation provides the basis of two things — the ability to perform a quality job in accordance with internationally recognised standards and the proof of competence necessary to achieve an accurate and repeatable technical results through accreditation.

Thermometer manufacturers that operate their own accredited calibration laboratory can adequately demonstrate traceability back to national and international standards of measurement and have equipment, procedures, compliance and competencies necessary to maintain that accreditation. Laboratory accreditation is appropriately granted by an independent accreditation body.

While organizations can be certified to a quality system standard, laboratories are accredited for specific measurement testing within specified ranges of measurement. These laboratories are continuously audited to demonstrate their ongoing competence and compliance to relevant standards by their respective accrediting bodies.

When an instrument is successfully certified, a calibration certificate is issued that can be presented to an organization's quality system auditors. The certificate states that the measurements or calibrations are traceable to national standards. This certificate issued then, establishes a verifiable chain of traceability back to a country's or international standards of measurement.

The traceability involved is paper traceability rather than technical traceability. It is the accreditation of the laboratory providing a specialist calibration service that establishes that technical traceability exists. Traceable calibration describes calibration is linked to ITS90, the International Temperature Scale, the fundamental definition of temperature established by the International Committee of Weights and Measures. Traceability insures interchangeability of instruments on an international scale as all are adhering to the same fundamentals.

Calibration can be established in three ways:

- Calibration using a calibration method based on first principles i.e. a fixed point that ITS-90 is based on such as the freezing point of pure zinc.
- Reference to a primary standard temperature whereby a traceable contact probe such as a thermocouple is used to determine the temperature of the radiation source, and the customer's unit is calibrated against the result.
- Direct or indirect comparison with a secondary standard of the same or similar kind. This calibration by comparison ensures that errors are known via a traceable route and adds the customer's unit onto the end of the traceable chain.

When considering what calibration and certification are, it is important to also look at what is erroneously believed within the industry. These beliefs include:

- A statement of National Institute of Standards and Technology (NIST) or National Laboratory traceability alone is sufficient.
- Using a quality management system alone is adequate.
- Absolute accuracy is not critical.
- ISO 9000 system requirements are adequate.
- The use of a certified laboratory is not necessary, and an independent calibration laboratory is fine.

All of the above-mentioned beliefs are false. For example, laboratory accreditation surpasses ISO 9000 system requirements which only concentrate on defined procedures and documentation. Comparatively, laboratory accreditation goes further, considering the tests used, the accuracy of results, procedure validation to enable accurate results, quality control so that long-term accuracy is maintained, as well as a full understanding of the meaning of the test procedures and the ability to see potential challenges and how they can be mitigated. Accreditation ensures technical validity and competence.

Who audits an accredited laboratory?

ISO/IEC 17025 establishes general requirements covering the competence of testing and calibration laboratories. It is the accrediting organisation auditors that audit accredited laboratory facilities.

Under ISO/IEC 17025, a laboratory's quality management system is audited and evaluated on an ongoing basis, ensuring continuous compliance to standard requirements. A supplier's competencies are proven through independent ISO/IEC 17025 accreditation and suppliers can show proof of this compliance.

The ISO/IEC 17025 standard specifies competence standards for organizations that produce testing and certification results. There are five main elements of the standard:

- Scope
- Normative References
- Terms and Definitions
- Management Requirements
- Technical Requirements

AMETEK Land (trading name of Land Instruments International) maintains three calibration laboratories globally that are accredited to ISO/IEC 17025 and audited annually by a third party. The three laboratories and their accrediting party are:

- In the United Kingdom by United Kingdom Accreditation Service (UKAS) (Registration 0034)
- In the U.S. by the Laboratory Accreditation Bureau (Registration L1164-1)
- In India by the National Accreditation Board for Testing & Calibration Laboratories (NABL) (Registration No. C-1200)



Within the AMETEK Land calibration laboratories, traceability is maintained based on a series of standards, including:

- **Working Standards** — There are multiple standard thermometers against which a customer's device is calibrated that cover a variety of wavelengths and temperature ranges. Their calibration is verified regularly against Reference standard thermometers.

- **Reference Standards** represent the optimum thermometers that are tightly controlled and in between external calibration at the National Physical Laboratory (NPL), or internally using fixed-point standards, they are inter-compared.
- **Fixed Point Standards** — ITS90 is defined in terms of the melting or freezing temperature of pure materials (metals), as change of state occurs at repeatable and precise temperatures. The AMETEK Land UKAS accredited laboratory maintains a set of these fixed-point standards, which are sealed crucibles of pure metal against which a thermometer may be calibrated. AMETEK Land therefore has a direct link to ITS90 and does not need externally calibrated standards at the temperatures covered by the fixed points.

Industries and applications where accreditation is critical

We would rightly guess that such safety-critical end users as aerospace, automotive and medical companies would demand certification of instruments. The reality is, however, that customers in every industry are demanding increasingly higher quality — and getting it. Some will remember that a certain number of failures was not only predictable, but expected; no longer. Today expectations are that a product should be right the first time. Especially in the metal industry, where rework means the long process of melting parts down to try again.

There's also a growing drive for safety. Safe products not only are better for the end customer to avoid injury, but safe products can also be used to avoid expensive insurance premiums, such as in the automotive industry. The following situations show industry segments where certification is, or might become important:

1. A top steel producer used certification of measured temperature. A likewise major automotive company purchased 100% of the steel production at a premium for the proven quality.
2. A plastic device maker makes a commodity product for years. All of a sudden they get the opportunity to make plastic motor covers for riding mowers. The company must scramble to prove certification of temperature measurements and adherence to quality standards.
3. For companies that perform heat-treating processes on metals, users are requiring proof via certification for every measurement involved, every item of the processes.

One of the most compelling reasons, however, is that in the future, it is almost certain their competition will be doing it. If a company does not opt for that level of quality, and they only operate to quality levels that address the mass market for non-demanding products, they can't hope to grow their businesses. Should their customer base fall off, they can't upsell because they lack the quality to do so.

AMETEK Land provides certification via its three accredited laboratories. Just as the company has always been a feature and quality-differentiated organization, certification enables AMETEK Land to prove that its products are superior. Now, it is offering the marketplace the same opportunity for high quality and the ability to be competitive.

Non-contact designs, optics, sensors and electronics have all improved dramatically over the years; the fundamental instruments are of much better quality than devices of even the not-too-distant past. Still it's not enough. Those with the best quality and the ability to prove it will survive, while others, over the long term, may very well fail.

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ABOUT AMETEK LAND

AMETEK Land is a global supplier of non-contact temperature measurement instrumentation, process imaging solutions and combustion and environmental analyzers. Founded in 1947, LAND has been the premium supplier of temperature measurement solutions and combustion emissions monitoring.

AMETEK Land has facilities in the United Kingdom, China, France, Germany, India, Italy, Japan, Singapore, Spain and the United States.

The full range of non-contact temperature products includes high accuracy hand-held portables, fixed system spot temperature sensors, thermal line scanners, process thermal imagers and calibration sources. Many application specific systems solutions are available