PRACTICE REPORT
LABORATORY ANALYSIS
ELECTROCHEMISTRY
CALIBRATION

Overview of the certified quality standards produced by HACH LANGE for pH and conductivity calibration

Certified Quality Standards

We carry out measurements and comparisons every day of our lives. One of the most frequently measured parameters is pH.
To ensure that the pH readings are true, the pH measurement sensors must be regularly calibrated. An incorrectly calibrated sensor is a major source of error.
The certified buffer solutions from HACH LANGE calibration laboratory offer the assurance of accurate calibration. This is backed up by the guaranteed shelf life of the IUPAC standards. Thanks to special packaging technology, the sealed solutions remain stable and ready to use for up to four years.

Authors:

Dr. Axel Bier
- HACH LANGE GmbH

Bernd Seidl
- HACH LANGE GmbH

Marlies Schrons
- vitatext

Assurance through certified buffer solutions


Deutscher Kalibrierdienst (DKD)
Akkreditierungsstelle
Deutschen AkkreditierungsRat
Akkreditierung
HACH LANGE GmbH
Königsweg 10
14163 Berlin
chemische Größen
DAR-Registriernummer: DKD-K-47901
Braunschweig, 2007-05-25

Fig. 1: DAR accreditation certificate for the HACH LANGE calibration laboratory

Fig. 2: Guaranteed shelf life of up to four years, thanks to the airtight sealed container.

In the spring of 2007, the calibration laboratory of HACH LANGE GmbH in Berlin was accredited by the DAR (Deutscher AkkreditierungsRat). This accreditation is recognised in 45 countries worldwide through the ILAC (International Laboratory Accreditation Cooperation).

What does accreditation mean?

Accreditation is the confirmation of competence by an independent body. In Germany the Deutsche AkkreditierungsRat (DAR) can issue such a confirmation of competence. Only laboratories that have thoroughly trained personnel and appropriate equipment and can carry out measurements with the necessary accuracy, are accredited.

Certified buffer solutions

The portfolio of calibration solutions for pH and conductivity measurements includes the complete set of certified IUPAC (DIN 19266) compliant pH buffer solutions and the certified OIML (Organization Internationale de Métrologie Légale) compliant conductivity standards. HACH LANGE produces calibration solutions for routine applications in accordance with equally high quality standards.

Greater assurance through certified calibration standards

The use of standard solutions that are produced by an accredited laboratory gives the user the assurance of full traceability to certified reference materials (CRM) and complete documentation of uncertainty levels. These reference materials can be obtained from, for example, the NIST (National Institute of Standards and Technology), DFM (Danish Fundamental Metrology) or PTB (Physikalisch Technische Bundesanstalt).

An individual certificate for every standard solution

The sealed container in which each HACH LANGE calibration solution is supplied contains a complete certificate of the solution's conformity and traceability. This conformity certificate corresponds to the requirements of the ISO 31 international standard and contains important information concerning the accompanying pH or conductivity standard, e.g.:

Batch number (Lot number)
The batch number is an important element of quality control. It identifies the run during which the calibration solution was produced. If calibration solutions have the same batch number, they were produced from the same starting materials under the same conditions.

Shelf life
The shelf life is the period for which the certified pH is guaranteed.

Shelf life guaranteed for 4 years

To ensure the long-term quality of the certified pH standard, the solution is first poured into a clean, thick walled bottle made of HDPE (high density polyethylene). The bottle is then placed in a container. HACH LANGE calibration solutions can be kept unopened for a number of years in this safe packaging. The certified pH standards are guaranteed for four years (except for pH 12.45, which is

guaranteed for two years), while the stability of a certified conductivity standard solution is guaranteed for two years (except for the 25 µS/cm standard, which is guaranteed for one year).

In addition to the conformity certificate, the high level of quality is documented on a calibration certificate, which is included in each packaging container. This specifies the real measured pH and the uncertainty of the corresponding pH standard and certifies the traceability. This certificate is a guarantee of the precision of the pH standard solution for the user.
HACH LANGE keeps reserve samples of each batch for four years. These samples are the basis for the unique 4 year stability warranty.

Primary and secondary pH standard solutions

To ensure the trueness of pH measurements, the standard solutions used for calibration must be traceable to international standards. Primary standards are extremely accurate. Their value is accepted without comparison with other standards of the same composition.
Secondary standards are derived from primary standards. They have the same composition as primary standards and are traceable to primary pH reference materials of the PTB (Physikalisch Technische Bundesanstalt, Germany) and internationally, the NIST (National Institute of Standards and Technology, USA) or the DFM (Danish Fundamental Metrology).

Highest quality pH measurement

The quality standards supplied by HACH LANGE for pH calibration can be totally traced to the standard hydrogen electrode. The pH of new customary pH standards was defined at a number of temperatures using the standard hydrogen electrode (IUPAC Recommendation, Pure Appl. Chem., Vol 74, No. 11, 2002).

The values of the primary and secondary standards are, like all measurements, associated with a level of uncertainty. For some pH primary standards, the expanded uncertainty, at 0.0016 pH (95 % confidence level) can be very low.

However, such standards are not suitable for use in the laboratory for the routine calibration of pH electrodes, as this low level of uncertainty cannot be achieved in normal laboratories and the shelf life of these standards is limited to just a few weeks.

Unlimited traceability to the standard hydrogen electrode

Seamless documentation from the defined pH method to the certified buffer solution is indispensable if a measurement result is to be regarded with any confidence.

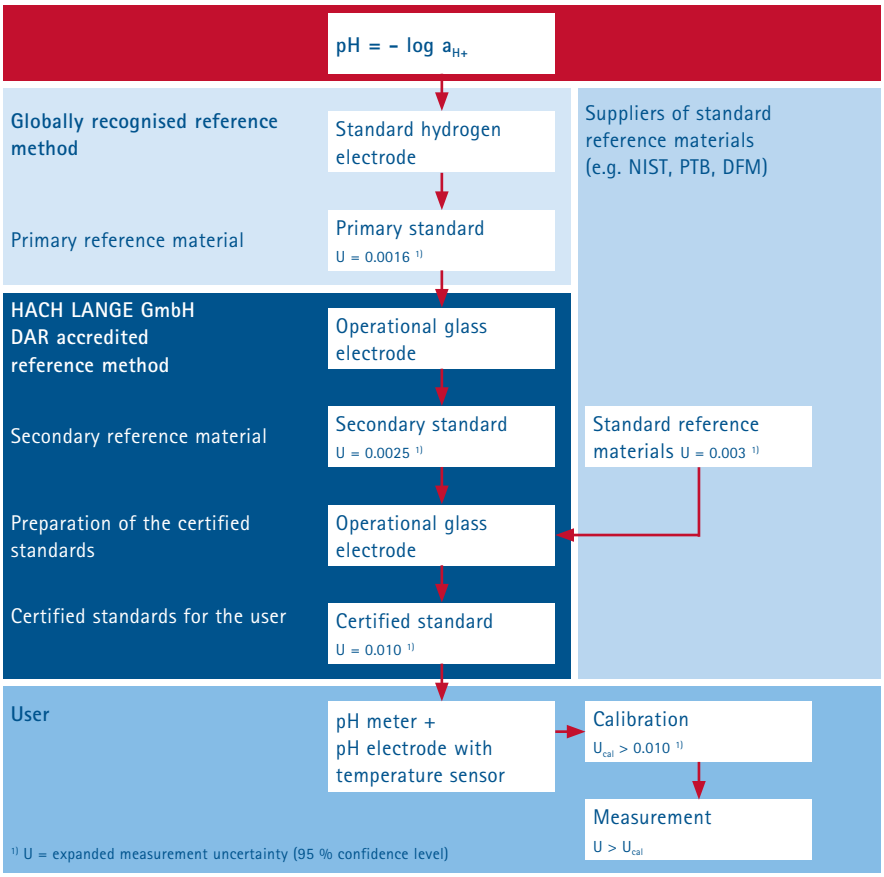

Fig. 3: Flow diagramme of traceability chain

Traceability, precision and quality

In principle, there are a number of ways to achieve a complete and uninterrupted chain of traceability. Producers of pH standard solutions who do not have a standard hydrogen electrode can either use primary standards to prepare their own secondary standards or they can buy external certified reference materials (CRM), e.g. from NIST.
Secondary standards are supplied in powder form or as ready-to-use solutions in ampoules, to eliminate any risk of preparation errors occurring. Finally secondary standards are used to produce the certified commercially available pH standards of HACH LANGE.
The use of ampoules, whose pH is traceable to the standard hydrogen electrode, makes it possible to achieve a lower level of uncertainty for the ready-to-use certified pH standard than if the production control was only based on the CRM, e.g. from NIST. The uncertainty of the certified pH standard is calculated and specified realistically in order to ensure its validity during the total shelf life of the product. In view of the precisely defined traceability to the CRM (the batch number of the CRM is shown in the certificate), HACH LANGE pH buffer solutions are referred to as certified pH standards.

As precise and reliable as possible

For daily laboratory practice, analyses and measurements need to be carried out not only with the greatest possible accuracy but with the accuracy appropriate to the specific application. The measurement accuracy must be known, e.g. in the form of the measurement uncertainty.
Most standard reference materials from NIST have an uncertainty of 0.005 pH (95 % confidence level). The expanded uncertainty of the commercially available certified pH standards from HACH LANGE is 0.010 pH (with the exception of 0.05 pH for standard pH 12.45; 95 % confidence level). They are less sensitive to impurities and offer an cost effective solution for applications in the laboratory and outdoors.

Cost savings and excellent analytical quality from a single source

Complying with all the requirements of the certified standards, HACH LANGE produces calibration solutions for normal routine applications. Users have a choice of solutions with pH 4.00, 7.00, 10.00 as well as molar KCl solutions, for the calibration of conductivity measuring cells. The individual needs of widely varied users are therefore satisfied in a practical and application oriented manner.

HACH LANGE Services


Contact us to place an order, request information or receive technical support.


On site technical support.


Seminars and workshops: Practical and hands on training.


Quality assurance, complete with standard solutions, instrument checks and test solutions.


www.hach-lange.com
Up to date and secure, with downloads, information and e-shop.

DOC042.52.20052.May09