Quality Assurance and Quality Control Technical Note

Introduction

For almost 50 years HYDROLAB products have provided dependable sensor technology in a multiple parameter instrument for montioring essential indicators required for assessing water quality in natural waters. Useable data are the lifeblood of any environmental water quality monitoring program and variation in measurement processes impairs the quality of the data that water resource professionals work so hard to obtain. Differences in operators, equipment calibration procedures, test methods, environmental conditions, and other factors can contribute to discrepancies between measurement results – whether comparisons are from time to time, site to site, instrument to instrument, or operator to operator.

The primary activities taken to assure and control data quality are aptly called quality assurance and quality control. Quality assurance (QA) refers to planned and systematic processes that provide confidence in a measurement process' ability to achieve its intended outcome. Examples of QA activities include methodology development and standards validation. Quality control (QC) activities, such as testing and inspection, aim to find defects in specific elements of the measurement process. The differences between QA and QC activities can be subtle, which is why they are often seen combined as simply "QA/QC."

HYDROLAB HL4 multiparamter water quality sonde

The "True Value"

Determining the "true value" of a water quality measurement is an important fundamental of any QA/QC program. To determine the true value, many professionals apply a second means of measuring the parameter of interest, such as another instrument that is kept serviced and calibrated just for quality control purposes or a grab sample that is evaluated using a trusted laboratory technique.

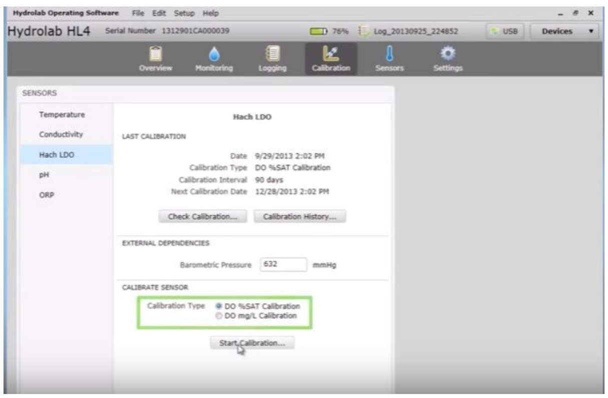
The true value used in a QA/QC program is a surrogate – a value very close to the true value and accepted as such. This surrogate true value is sometimes referred to as an assigned value, accepted value, or reference value. Calibration standards may also be used as a reference value. Good QA/QC programs require robust calibration procedures that ultimately provide valuable information about, and confidence in, the instrument's performance. The following section highlights key information made available during a HYDROLAB multi-parameter water quality sonde calibration.

HYDROLAB Operating System for use with HL Series Sondes

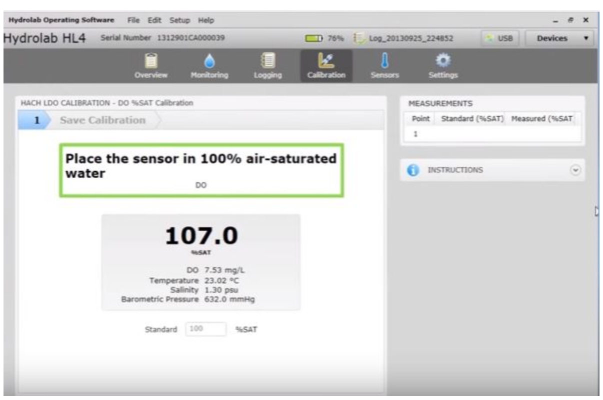
The HYDROLAB Operating System is a powerful software tool that helps to make better decisions, minimize errors, and increase efficiency in the lab and on the deployment site.

Calibration Process

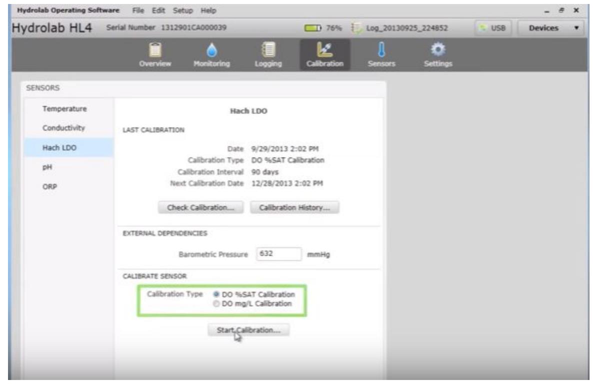
- Calibrate sensors and check sensor calibrations with guided and semi-automated calibration routines
- Access and create metadata that give system information, calibration history, user information, and site information



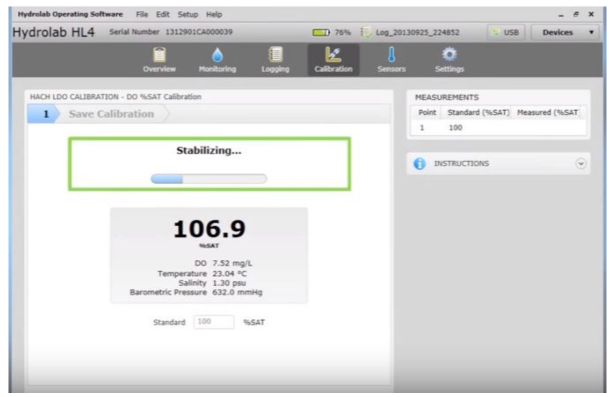
Step 1. The HYDROLAB Operating System streamlines HYDROLAB HL4 calibration tasks with user scheduled calibration intervals that indicate when calibration is due.



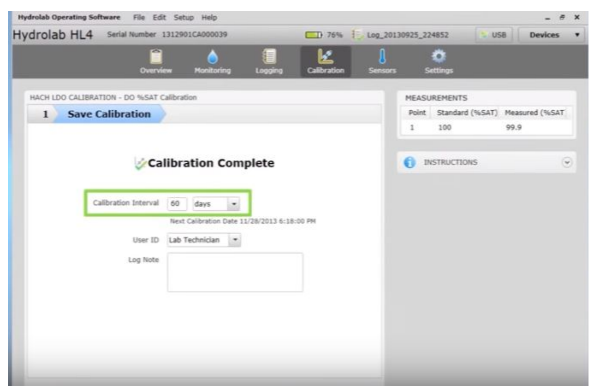
Step 2. Guided and semi-automated calibration routines lead the user through the calibration process and a check calibration procedure can be used to avoid a complete calibration.



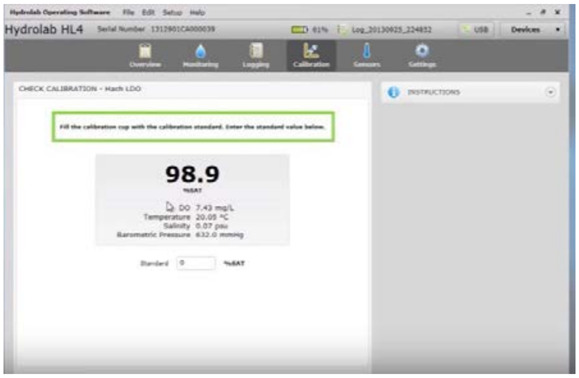
Step 3. Calibrate a sensor from the overview calibration or sensors tab. Choose the calibration type and start calibration.



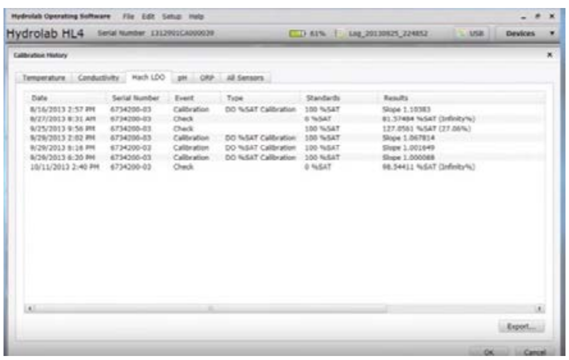
Step 4. The system determines when the reading is stable.



Step 5. When calibration is complete set the desired calibration interval to schedule the next calibration; adding the user identification and notes is optional. This information will be kept in the calibration history.



Step 6. To know if a calibration is still acceptable do a calibration check. When the calibration check is complete, confirm the results are acceptable. Set the desired calibration interval to schedule the next calibration.



Step 7. The recalibrate calibration history shows information about calibration and calibration checks. Look at each sensor or all sensors together for metadata that include date, calibration standards and results.

Field Methods for QA/QC

When real time or remote instruments are first placed into the field, accompanying measurements should be taken with a handheld water quality instrument or by some other means. These field measurements – which are sometimes paired samples taken for laboratory analyses – serve as QC points. These independent field measurements are extremely important as they are the only check for the accuracy and performance of the real time or remote water quality measurement. Each time an instrument is removed and/or replaced another complete set of field measurements should be collected.

Field measurements should be obtained as frequently as budgets and practicality allow, to verify performance of the instruments between changeovers or to verify unusual occurrences. Once the previously deployed instrument is returned to the laboratory, field measurement QC points are used to determine if post-calibrations are required or to verify or reject suspicious data. Also, by the end of the monitoring season, each site's data sets have regular field QC measurements to support data validity.

Field QC measurements identify when sensor drift begins to affect data quality. Usually dependent on the productivity of the water, fouling or sensor drift could start to affect the performance of the sensors in as little as a few days to as much as a few weeks. Analysis of historic data from QA/QC programs allows water resource professionals to set strict acceptance criteria for the data collected.

Years of experience with various monitoring programs has established some basic acceptance criteria that are generally easily obtainable in the field (Table 1). Data collected

Parameter	Basic Acceptance Criteria (variation outside the value shown requires recalibration)
Temperature	± 0.3 °C
Specific Conductance	± 10% of reading
Dissolved Oxygen	± 0.3 mg/L
pH	± 0.5 pH units
Turbidity	± 10% of range

***Table 1**. Electronic Water Quality Data Acceptance Criteria*

from the real time or remote instrument can be within these user-set acceptance limits, initially or by post-calibration. Rigorous execution of QA/QC programs can yield regularly obtainable data, that have smaller variations and tighter, more stringent acceptance ranges.

Summary/Conclusion

Today's water resource professionals are looking for high quality data you can trust from the best quality of instruments. Instruments such as HYDROLAB produce high quality data for many applications and by leveraging the HYDROLAB Operating System you can maximize uptime with streamlined calibration tasks. This powerful software tool helps to make better decisions, minimize errors, and increases efficiency in the lab and on the deployment site.

For more information on how to streamline calibration tasks with the Hydrolab Operating System, contact OTT Hydromet.

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