

Technical Note

Aqua TROLL[®] 200 Conductivity Accuracy

Tony Arnerich, Senior Chemist

January 2007

Introduction

The Aqua TROLL[®] 200 water quality instrument measures and records conductivity, level, and temperature. This technical note provides an overview of the instrument's conductivity measurement performance.

Calibration Overview

The Aqua TROLL 200 contains two levels of conductivity channel calibration: a permanent "factory calibration" and a user-performed, re-writable "user calibration." The factory calibration guarantees a high degree of linearity of measurement response across the operating range of 5 to 100,000 micro Siemens/cm ($\mu\text{S/cm}$). This is described as a "flat" response, and it allows the instrument to be calibrated at a single conductivity value and then be used to measure throughout the operating range while delivering a constant accuracy. The factory calibration process also delivers sufficient absolute accuracy for many intended purposes without needing to perform an initial field calibration.

Standard operating procedures of most water monitoring organizations specify that conductivity measuring instruments shall be calibrated in the field immediately before deployment. This allows instruments to collect high quality data in spite of changes brought about by time, field exposure, or handling. This requirement is met via the user calibration. The effect of the user calibration is to apply a scaling factor to all subsequent measurement results. New instruments ship with a cell constant (K_{cell}) of 1.000. When a user calibration is performed the K_{cell} constant is adjusted to some new value, for example 1.002 or 0.999.

It is good practice to check that the instrument is in calibration at the beginning and end of critical deployments, and to understand when instruments at field sites will require cleaning in order to remove fouling that may have accumulated.

Aqua TROLL 200 Accuracy Statement

The Aqua TROLL 200 is delivered with a factory calibration that meets the following conductivity accuracy specifications:

Range of Operation	Actual Conductivity	Specific Conductivity*
5 – 80,000 $\mu\text{S/cm}$	$\pm 0.5\%$ of reading + 1 $\mu\text{S/cm}$	$\pm 0.55\%$ of reading + 1 $\mu\text{S/cm}$
80,000 – 100,000 $\mu\text{S/cm}$	$\pm 1\%$ of reading	$\pm 1\%$ of reading

*After thermal stabilization

The accuracy figures represent an expanded uncertainty using a coverage factor $k=2$ to approximate a 95% confidence level. It is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM).

Accuracy after User Calibration

The table below summarizes the expected Actual Conductivity accuracy after performing user calibrations in the range 100 – 60,000 $\mu\text{S/cm}$ using various accuracy levels of calibration standard, and tested throughout the operating range.

Calibration Standard Accuracy	Accuracy when measuring below 80,000 $\mu\text{S/cm}$	Accuracy when measuring above 80,000 $\mu\text{S/cm}$
0.50% (commercial)	$\pm 0.7\%$ of reading + 1 $\mu\text{S/cm}$	$\pm 1.2\%$ of reading
0.25% (commercial)	$\pm 0.5\%$ of reading + 1 $\mu\text{S/cm}$	$\pm 1\%$ of reading
0.05% (NIST)	$\pm 0.4\%$ of reading + 1 $\mu\text{S/cm}$	$\pm 0.9\%$ of reading

Copyright © 2007 by In-Situ Inc.

In-Situ and the In-Situ logo, Win-Situ, TROLL, BaroTROLL, HERMIT, FlowSense, RuggedReader, RuggedCable, and RDO are trademarks or registered trademarks of In-Situ Inc.