DFM
Danish National Metrology Institute

DANAK
CAL Reg.nr. 255

CIPM MRA

DFM A/S
Kogle Alle 5 | DK-2970 Hørsholm
Tel. +45 7730 5800 | www.dfm.dk

Calibration certificate

Electrolytic conductivity

Client	Hamilton Bonaduz AG
Address	Via Crusch 8, CH-7402 Bonaduz, Switzerland
Telephone/Fax	+41 58 610 12 84
Contact person	Ottilia Clopath
Date received	2019-06-03

Identification	Basic conductivity 12880 µS/cm
Batch	REF 238988 LOT 111069806
Date of calibration	2019-06-07

Result: **Basic conductivity 12880 µS/cm, REF 238988 LOT 111069806, Sample 1**
Laboratory environmental conditions: T = 23,0 ± 0,5 °C, RH = 45 ± 5 %, $p(CO_2)/p_0$ = 400 ± 75 ppm

T_0 (°C)	κ (T_0) (µS/cm)	$U(\kappa)$ (µS/cm)
25,00	12828	10

The reported measurement uncertainty U is given as the standard uncertainty multiplied with a coverage factor of k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been calculated in accordance with EA-04/2.

Method and details of the measurement is given on page 2.

The calibration is traceable to recognised national and international standards.

The calibration has been performed under DANAK accreditation no. 255.

Parts of the calibration certificate can only be reproduced with the written consent of DFM.

DANAK is the national accreditation body in Denmark in compliance with EU regulation No. 765/2008.

DANAK participates in the multilateral agreements for testing and calibration under European co-operation for Accreditation (EA) and under International Laboratory Accreditation Cooperation (ILAC) based on peer-evaluation. Accredited test reports and calibration certificates issued by laboratories accredited by DANAK are recognized cross border by members of EA and ILAC equal to test reports and calibration certificates issued by these members' accredited laboratories.

This certificate is consistent with the capabilities that are included in Appendix C of the MRA drawn up by the CIPM. Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see http://www.bipm.org).

Date: 2019-06-07

Sune Veltzé
Ph.D.

Method

The solution was supplied by the client. Solution samples were provided in hdpe bottles containing 500 mL. The bottles were closed with a screw cap and seal.

The conductivity has been derived from a measurement of the impedance of the solution in the frequency range from 333 Hz to 3 kHz and from the calibrated cell constant of the cell used. The cell was temperature controlled by submersion in an oil bath with stability better than 2 mK. The value for the conductivity has been referred to the given temperature(s) using a correction based on the measurement of the temperature coefficient of the solution. At 25 °C the average temperature deviation was 0 mK and the temperature coefficient was determined to (1,91 ± 0,03) %/°C.

An uncertainty contribution for CO_2 sensitivity of the solution has been taken into account. The average CO_2 partial pressure was measured near the measurement position and is given with the result.

DFM participates in the international collaboration under the Metre Convention in the CCQM Electrochemical Analysis Working Group. This includes participation in international comparisons of measurement of conductivity.

International comparison results and approved measurement capabilities are available at http://kcdb.bipm.org/