



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

QUALITY CONTROL SERVICES, INC.
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CALIBRATION

Valid To: September 30, 2019

Certificate Number: 1550.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Chemical

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
pH Meter ³ – pH Electrical Simulation of pH Indicator	4 pH 7 pH 10 pH (414 to -414) mV	0.042 pH 0.026 pH 0.049 pH 0.14 mV	Standard pH solutions DMM
Conductivity Meters ³	10 µS/cm 100 µS/cm 1000 µS/cm 10 000 µS/cm	0.59 µS/cm 2.9 µS/cm 14 µS/cm 120 µS/cm	Standard conductivity solutions
Dissolved Oxygen Meters ³ – Fixed Points	0 % DO 100 % DO	0.30 % DO 0.37 % DO	Saturated solution at 25 °C
Turbidimeters ³	(< 0.1 to 1) NTU (1 to 20) NTU (21 to 200) NTU (201 to 1000) NTU (1001 to 4000) NTU	0.074 NTU 0.84 NTU 1.4 NTU 6.9 NTU 13 NTU	Nephelometric turbidity unit standards

Parameter/Equipment	Range	CMC ² (±)	Comments
Refractometers ³	1.39986 ⁿ _D 1.46458 ⁿ _D 40 % Brix 69.64 % Brix	0.000 37 ⁿ _D 0.0044 ⁿ _D 0.19 % Brix 1.8 % Brix	ⁿ _D is a unit for refractive index % Brix is unit for refractive index specific to sugar solutions Accredited refractive index standards
Spectrophotometers ³			
Transmittance at (440 to 635) nm	10 % <i>T</i> 50 % <i>T</i>	0.17 % <i>T</i> 0.35 % <i>T</i>	Spectronic glass filter standards
Wavelength	400 nm peak 525 nm peak 780 nm peak	0.59 nm 0.58 nm 0.59 nm	<i>T</i> = transmittance

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouple Indicators –			
Type J	(-200 to 800) °C	0.28 °C	Fluke 702/726 process calibrator
Type K	(-200 to 1300) °C	0.23 °C	
Type S	(0 to 1500) °C	0.51 °C	
Type T	(-200 to 400) °C	0.36 °C	
Electrical Simulation of RTD Indicators –			
Pt 385, 100 Ω	(-200 to 800) °C	0.18 °C	Fluke 702/726 process calibrator
Pt 3926, 100 Ω	(-200 to 630) °C	0.18 °C	
Pt 3916, 100 Ω	(-200 to 660) °C	0.18 °C	
Ni 672, 120 Ω	(-80 to 260) °C	0.20 °C	

III. Fluid Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
Fume Hoods – Air Velocity Only ³	(60 to 120) ft/min	12 ft/min	Pacer DA40T anemometer

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Balances and Scales ³	(1 to 50) mg	0.0011 mg	ASTM Class 1 weights
	(>50 to 100) mg	0.0016 mg	
	(>100 to 200) mg	0.0024 mg	
	(>200 to 300) mg	0.0035 mg	
	(>300 to 500) mg	0.0040 mg	
	>500 mg to 5 g	0.0084 mg	
	(>5 to 30) g	0.014 mg	
	(>30 to 50) g	0.020 mg	
	(>50 to 100) g	0.063 mg	
	(>100 to 200) g	0.072 mg	
	(>200 to 400) g	0.14 mg	
	(>400 to 500) g	0.18 mg	
	>500 g to 1 kg	0.34 mg	
	(>1 to 2) kg	1.4 mg	
	(>2 to 5) kg	1.9 mg	
	(>5 to 10) kg	9.2 mg	
(>10 to 30) kg	83 mg	ASTM Class 6 weights	
(>30 to 50) kg	84 mg		
(>50 to 100) kg	98 mg		
(>100 to 300) kg	830 mg		
Moisture Analyzers ³	1 mg to 5 g	0.082 mg	ASTM Class 1 weights plus temperature measurement of heating element (refer to parameter temperature – measure)
	(>5 to 30) g	0.083 mg	
	(>30 to 50) g	0.084 mg	
	(>50 to 100) g	0.10 mg	
	(>100 to 200) g	0.11 mg	
	(>200 to 500) g	0.83 mg	
Scales (Class III) ³	(0.001 to 2500) lb	0.82R	NIST Class F weights
	(>2500 to 5000) lb	1.0R	NIST Class F weights with substitution weights

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Pipettes ³ –	(0.1 to 0.5) µL (0.5 to 2.5) µL (2.5 to 5) µL (5 to 10) µL (10 to 50) µL (50 to 100) µL (100 to 500) µL (500 to 1000) µL (1000 to 2500) µL (2500 to 5000) µL	0.035 µL 0.042 µL 0.054 µL 0.025 µL 0.088 µL 0.083 µL 0.11 µL 0.58 µL 1.4 µL 2.3 µL	Gravimetric method using: analytical balances
Volumetric Dispensers ³	(5 to 10) mL (10 to 25) mL (25 to 50) mL (50 to 100) mL 100 mL to 1 L	52 µL 110 µL 210 µL 350 µL 410 µL	Gravimetric method using analytical balances/precision balances
Titrators ³ –			
pH	4 pH 7 pH 10 pH	0.042 pH 0.026 pH 0.049 pH	Standard pH solutions
Electrical Simulation of pH Indicator	(414 to -414) mV	0.13 mV	DMM
Burette Volume	Up to 10 mL >10 mL to 20 mL	0.0061 mL 0.012 mL	Gravimetric method

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Mass ⁶	1 mg	0.000 86 mg	OIML E2 mass standards and Sartorius SC2 as comparator
	(>1 to 2) mg	0.000 72 mg	
	(>2 to 3) mg	0.000 70 mg	
	(>3 to 5) mg	0.000 74 mg	
	(>5 to 10) mg	0.000 77 mg	
	(>10 to 20) mg	0.000 22 mg	
	(>20 to 30) mg	0.000 27 mg	
	(>30 to 50) mg	0.000 33 mg	
	(>50 to 100) mg	0.000 57 mg	
	(>100 to 200) mg	0.000 59 mg	
	(>200 to 300) mg	0.000 76 mg	
	(>300 to 500) mg	0.0011 mg	
	>500 mg to 1 g	0.0021 mg	
	(>1 to 2) g	0.0017 mg	OIML E2 mass standard and Mettler AT 106 as comparator
	(>2 to 3) g	0.0021 mg	
	(>3 to 5) g	0.0024 mg	OIML E2 mass standard and Mettler AT 106 as comparator
	(>5 to 10) g	0.0040 mg	
	(>10 to 20) g	0.0058 mg	
	(>20 to 30) g	0.0084 mg	
	(>30 to 50) g	0.013 mg	
(>50 to 100) g	0.027 mg	OIML E2/ ASTM Class 0 mass standards and Mettler AT 201 as comparator	
(>100 to 200) g	0.045 mg		
(>200 to 300) g	0.051 mg	ASTM Class 0 mass standards and Mettler BC51000 as comparator	
(>300 to 500) g	0.10 mg		
>500 g to 1 kg	0.11 mg		
(>1 to 2) kg	0.47 mg	ASTM Class 0 mass standards and Sartorius S10000 as comparator	
(>2 to 3) kg	0.62 mg		
(>3 to 5) kg	0.96 mg		
(>5 to 10) kg	1.8 mg		
(>10 to 20) kg	5.7 mg	ASTM Class 0 mass standards and Sartorius CC 30002 as comparator	
(>20 to 30) kg	6.0 mg		

Parameter/Equipment	Range	CMC ² (±)	Comments
Rotational Speed ³	100.0 rpm (100.1 to 1000.0) rpm (1000.1 to 2000.0) rpm (2000.1 to 7500.0) rpm (7500.1 to 9999.9) rpm 10000 rpm (10001 to 20000) rpm (20001 to 30000) rpm	0.082 rpm 0.18 rpm 0.59 rpm 0.94 rpm 1.0 rpm 1.2 rpm 1.7 rpm 2.0 rpm	Amtek 1965 strobe/tachometer

V. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Thermometers and Temperature Sensors –			Temperature baths or furnace and:
Liquid-in-Glass Thermometers ⁷	(-80 to -1) °C (0 to 150) °C (151 to 400) °C	0.073 °C 0.034 °C 0.35 °C	Fluke 1523 indicator with 5628 PRT probe for (-80 to 0) °C;
RTD and Thermistor Sensors	(-80 to -1) °C (0 to 150) °C (151 to 400) °C (401 to 600) °C	0.032 °C 0.016 °C 0.34 °C 0.63 °C	Fluke/Hart Scientific 1502A indicator with Burns 17660 PRT probe for (0 to 150) °C;
Thermocouple Thermometers	(-80 to -1) °C (0 to 150) °C (151 to 400) °C (401 to 600) °C (601 to 1000) °C	0.094 °C 0.070 °C 0.35 °C 1.1 °C 2.0 °C	Fluke 1523 indicator w/5628 PRT probe for (151 to 600) °C; Fluke 702/726 indicator w/Omega XCIB thermocouple for (601 to 1000) °C
Temperature ³ – Measure, Freezers, Refrigerators, Cold Boxes, Incubators, Environmental Chambers, Water Baths, Autoclaves, Hot Plates, Furnaces, Ovens	(-80 to -1) °C (0 to 150) °C (151 to 400) °C (401 to 600) °C (601 to 1000) °C	0.27 °C 0.36 °C 0.61 °C 1.8 °C 3.5 °C	Fluke 51/52 digital thermometer

Parameter/Equipment	Range	CMC ² (±)	Comments
Relative Humidity ³ – Measure	(40 to 60) % RH	0.69 % RH	Fluke 1620A

¹ This laboratory offers commercial calibration service and field calibration service.

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

³ Field calibration service is available for this calibration and this laboratory meets A2LA *RI04 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

⁴ For the parameter Dissolved Oxygen, DO represents “Dissolved Oxygen” and for the parameter Turbidity, NTU represents Nephelometric Turbidity Units.

⁵ For the parameters Analytical and Precision Balances, Scales and Moisture Analyzers and Moisture Balances, R represents the numerical value of the resolution of the device.

⁶ English/Avoirdupois Mass values will be determined using accepted international conversion factors.

⁷ CMC uncertainties based on total immersion thermometers.



Accredited Laboratory

A2LA has accredited

QUALITY CONTROL SERVICES, INC.

Portland, OR

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSLI Z540-1-1994 and R205 – *Specific Requirements: Calibration Laboratory Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).



Presented this 26th day of October 2017.

A handwritten signature in black ink, appearing to read "L. J. ...", positioned above a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 1550.01
Valid to September 30, 2019
Revised October 26, 2018

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.