



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

QUALITY CONTROL SERVICES, INC.
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CALIBRATION

Valid To: September 30, 2021

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 calibrations^{1, 9}:

I. Chemical

Parameter/Equipment	Range	CMC ^{2, 4, 10} (±)	Comments
pH Meter ³ – pH Electrical Simulation of pH Indicator	4 pH 7 pH 10 pH (414 to -414) mV	0.051 pH 0.029 pH 0.053 pH 0.31 mV	Standard pH solutions DMM
Conductivity Meters ³	10 µS/cm 100 µS/cm 1000 µS/cm 10 000 µS/cm	0.62 µS/cm 4.3 µS/cm 15 µS/cm 140 µS/cm	Standard conductivity solutions
Dissolved Oxygen Meters ³ – Fixed Points	0 % DO 100 % DO	0.32 % DO 0.67 % 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	0.083 NTU 0.87 NTU 2.2 NTU 5.0 NTU 11 NTU	Formazin nephelometric turbidity unit standards

Parameter/Equipment	Range	CMC ^{2, 10} (±)	Comments
Refractometers ³	1.3330 ⁿ _D 1.399 86 ⁿ _D 1.465 46 ⁿ _D 0 % Brix 40 % Brix 70 % Brix	0.000 45 ⁿ _D 0.000 43 ⁿ _D 0.000 55 ⁿ _D 0.33 % Brix 0.23 % Brix 0.16 % 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>	0.11 % <i>T</i> 0.32 % <i>T</i>	Spectronic glass filter standards
Wavelength	400 nm peak 525 nm peak 780 nm peak	0.63 nm 0.57 nm 0.63 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	0.39 °C	Fluke 702/726 process calibrator
Type K	(-200 to 1300) °C	0.30 °C	
Type S	(0 to 1500) °C	0.76 °C	
Type T	(-200 to 400) °C	0.38 °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	0.23 °C	

III. Fluid Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
Fume Hoods – Air Velocity Only ³	(60 to 120) ft/min	15 ft/min	Extech 407119A anemometer

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Balances and Scales ³	(1 to 50) mg	0.000 83 mg	ASTM Class 1 weights
	(>50 to 100) mg	0.0013 mg	
	(>100 to 500) mg	0.0030 mg	
	>500 mg to 3 g	0.0058 mg	
	(>3 to 5) g	0.0075 mg	
	(>5 to 10) g	0.0099 mg	
	(>10 to 30) g	0.017 mg	
	(>30 to 50) g	0.031 mg	
	(>50 to 100) g	0.063 mg	
	(>100 to 200) g	0.070 mg	
	(>200 to 300) g	0.13 mg	
	(>300 to 400) g	0.15 mg	
	(>400 to 500) g	0.59 mg	
	>500 g to 1 kg	0.74 mg	
	(>1 to 2) kg	1.3 mg	
	(>2 to 3) kg	1.8 mg	
	(>3 to 5) kg	2.3 mg	
	(>5 to 10) kg	9.1 mg	
	(>10 to 30) kg	82 mg	
	(>30 to 50) kg	84 mg	ASTM Class 6 weights
(>50 to 100) kg	98 mg		
(>100 to 200) kg	820 mg		
Moisture Analyzers ³	(>200 to 300) kg	830 mg	ASTM Class 1 weights plus temperature measurement of heating element (refer to parameter temperature – measure)
	1 mg to 10 g	0.082 mg	
	(>10 to 20) g	0.084 mg	
	(>20 to 50) g	0.093 mg	
	(>50 to 100) g	0.10 mg	
	(>100 to 200) g	0.11 mg	
	(>200 to 300) g	0.82 mg	
(>300 to 400) g	0.83 mg		
Scales (Class III) ³	(>400 to 500) g	1.0 mg	NIST Class F weights NIST Class F weights with substitution weights
	(0.001 to 2500) lb	0.82R	
	(>2500 to 5000) lb	1.0R	

Parameter/Equipment	Range	CMC ² (±)	Comments
Pipettes ³ –	(0.1 to 0.5) µL (0.5 to 2.5) µL (2.5 to 5) µL (5 to 10) µL	0.061 µL 0.050 µL 0.065 µL 0.054 µL	Gravimetric method using: analytical balances
	(10 to 100) µL (100 to 500) µL (500 to 1000) µL (1000 to 2500) µL (2500 to 5000) µL	0.16 µL 0.34 µL 0.66 µL 1.4 µL 3.3 µL	
Volumetric Dispensers ³	(5 to 10) mL (10 to 25) mL (25 to 50) mL	9.4 µL 9.6 µL 12 µL	Gravimetric method using analytical balances/precision balances
Titrators ³ –			
pH	4 pH 7 pH 10 pH	0.051 pH 0.029 pH 0.053 pH	Standard pH solutions
Electrical Simulation of pH Indicator	(414 to -414) mV	0.31 mV	DMM
Burette Volume	Up to 10 mL	0.017 mL	Gravimetric method

Parameter/Equipment	Range	CMC ² (±)	Comments
Mass ⁶	1 mg	0.000 78 mg	OIML E2 mass standards and Sartorius SC2 as comparator
	(>1 to 2) mg	0.000 66 mg	
	(>2 to 3) mg	0.000 64 mg	
	(>3 to 5) mg	0.000 66 mg	
	(>5 to 10) mg	0.000 24 mg	
	(>10 to 20) mg	0.000 22 mg	
	(>20 to 30) mg	0.000 29 mg	
	(>30 to 50) mg	0.000 35 mg	
	(>50 to 100) mg	0.000 63 mg	
	(>100 to 200) mg	0.000 67 mg	
	(>200 to 300) mg	0.000 84 mg	
	(>300 to 500) mg	0.0012 mg	
	>500 mg to 1 g	0.0023 mg	
	(>1 to 2) g	0.0018 mg	OIML E2 mass standards and Mettler AT 106 as comparator
	(>2 to 3) g	0.0022 mg	
	(>3 to 5) g	0.0023 mg	
	(>5 to 10) g	0.0034 mg	
	(>10 to 20) g	0.0045 mg	
	(>20 to 30) g	0.0065 mg	
	(>30 to 50) g	0.010 mg	OIML E2/ ASTM Class 0 mass standards and Mettler AT 201 as comparator
(>50 to 100) g	0.020 mg		
(>100 to 200) g	0.039 mg	ASTM Class 0 mass standards and Mettler BC51000 as comparator	
(>200 to 300) g	0.042 mg		
(>300 to 500) g	0.097 mg		
>500 g to 1 kg	0.11 mg	ASTM Class 0 mass standards and Sartorius S10000 as comparator	
(>1 to 2) kg	0.47 mg		
(>2 to 3) kg	0.45 mg		
(>3 to 5) kg	0.59 mg		
(>5 to 10) kg	1.2 mg	ASTM Class 0 mass standards and Sartorius CC 30002 as comparator	
(>10 to 20) kg	7.9 mg		
(>20 to 30) kg	8.0 mg		

Parameter/Equipment	Range	CMC ² (±)	Comments
Rotational Speed ³ – Tachometers	100.0 rpm (100.1 to 2000.0) rpm (2000.1 to 5000.0) rpm (5000.1 to 7500.0) rpm (7500.1 to 9999.9) rpm 10 000 rpm (10 001 to 20 000) rpm (20 001 to 30 000) rpm	0.58 rpm 0.60 rpm 1.2 rpm 1.3 rpm 1.4 rpm 1.5 rpm 1.9 rpm 2.3 rpm	Hoto ESL-200A strobe/tachometer
Rotational Devices, including Centrifuges, Shakers, Stirrers, etc.	(100 to 10 000) rpm (10 001 to 20 000) rpm (10 001 to 20 000) rpm	6.1 rpm 6.4 rpm 6.5 rpm	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 1.2 °C	Fluke/Hart Scientific 1502A indicator with Burns 5615-12 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 1.5 °C 2.1 °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
Infrared (IR) Thermometers	(-15 to <0) °C (0 to <50) °C (50 to <100) °C (100 to 120) °C	0.79 °C 0.66 °C 0.31 °C 0.28 °C	Fluke 4180 IR calibrator

Parameter/Equipment	Range	CMC ^{2, 8, 10} (\pm)	Comments
Thermometers and Temperature Sensors – (cont)			
Infrared (IR) Thermometers	(>120 to 200) °C (>200 to 350) °C (>350 to 500) °C	0.45 °C 0.62 °C 1.1 °C	Fluke 4181 IR calibrator
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 1000) °C	0.33 °C 0.39 °C 0.83 °C 7.9 °C	Fluke 51/52 digital thermometer
Relative Humidity ³ – Measure	(40 to 60) % RH	0.61 % 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 R104 – *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.

⁸ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

⁹ This scope meets A2LA's *P112 Flexible Scope Policy*.

¹⁰ In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.



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 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCCL 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 April 2017).



Presented this 11th day of December 2019.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1550.01
Valid to September 30, 2021
Revised January 30, 2020

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