National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200348-0**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Fluke Calibration, American Fork-Primary Temperature Laboratory 799 E. Utah Valley Drive American Fork, UT 84003-9775 Mr. Raimone King Phone: 801-847-1187 Fax: 801-763-1010 E-mail: rai.king@flukecal.com URL: https://us.flukecal.com/support/accreditations	**Fields of Calibration** Electromagnetics - DC/Low Frequency Thermodynamic This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01)

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty Note 3	Remarks
ELECTROMAGNETICS – DC/LOW FREQUENCY			
DC RESISTANCE AND CURRENT (20/E05)			
DC Resistance	1 Ω > 1 Ω to 10 Ω > 10 Ω to 100 Ω > 100 Ω to 1 kΩ > 1 kΩ to 10 kΩ	0.32 μΩ/Ω 0.36 μΩ/Ω 0.39 μΩ/Ω 0.42 μΩ/Ω 0.45 μΩ/Ω	MI 6010 Bridge
	> 10 kΩ to 100 kΩ > 100 kΩ to 300 kΩ > 300 kΩ to 500 kΩ > 500 kΩ to 1 MΩ	2.4 μΩ/Ω 2.9 μΩ/Ω 3.1 μΩ/Ω 4.5 μΩ/Ω	Fluke 8508A ratio measurement
Digital Thermometry Indicators			
Ratio Function	0 to 1.0	9.0×10^{-8}	Precision thermometer readout ratio measurement Note: Ratio uncertainty is stated in terms of ratio which is dimensionless
Resistance Function	1 Ω > 1 Ω to 10 Ω > 10 Ω to 25 Ω	7.5 μΩ/Ω 3.8 μΩ/Ω 1.0 μΩ/Ω	Readout calibration resistor set

2023-09-18 through 2024-09-30
Effective dates

For the National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200348-0**

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty Note 3	Remarks
	> 25 Ω to 100 Ω > 100 Ω to 10 kΩ > 10 kΩ to 40 kΩ > 40 kΩ to 100 kΩ > 100 kΩ to 500 kΩ > 500 kΩ to 1 MΩ	0.80 μΩ/Ω 1.2 μΩ/Ω 2.0 μΩ/Ω 4.0 μΩ/Ω 5.0 μΩ/Ω 42 μΩ/Ω	
DC Current – Measure	0.01 mA > 0.01 mA to 1 mA > 1 mA to 1.414 mA	0.022 μA 0.44 μA 0.55 μA	Measurement of digital thermometer readout excitation current
DC VOLTAGE (20/E06)			
Digital Thermometry Indicators			
Voltage Function	0 mV to 50 mV > 50 mV to 100 mV	0.45 μV 0.75 μV	Characterized Keithley nanovoltmeter
Digital Thermometers Reference Junction Compensation Circuits	0.0 °C to 25.0 °C	17 mK	Temperature bath with thermistor
THERMODYNAMIC			
HUMIDITY (20/T02)			
Calibration of Humidity Generators			
Humidity Function	7 % rh to 50 % rh > 50 % rh to 70 % rh > 70 % rh to 95 % rh	0.30 % rh 0.35 % rh 0.40 % rh	
Temperature Function	0 °C to 70 °C	0.010 °C	
Calibration of Digital Thermo-Hygrometers			
Humidity Function	10 % rh to 95 % rh	0.50 % rh	
Temperature Function	15 °C to 35 °C	0.032 °C	

2023-09-18 through 2024-09-30
Effective dates

For the National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200348-0**

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
LABORATORY THERMOMETERS, DIGITAL and ANALOG (20/T03)			
Digital Thermometer with PRT System			Comparison or Mini Fixed Points Note: Probe uncertainty is not included in stated uncertainty.
	-197 °C	6.0 mK	
	-100 °C to -50 °C	6.0 mK	
	-50 °C to 0 °C	5.0 mK	
	0.010 °C	5.0 mK	
	0 °C to 200 °C	8.0 mK	
	> 200 °C to 300 °C	9.0 mK	
	> 300 °C to 400 °C	10 mK	
	> 400 °C to 500 °C	11 mK	
	660.323 °C	15 mK	FPAl
Digital Thermometer with Thermistor	0 °C to 100 °C	1.8 mK	By comparison
RADIATION THERMOMETRY(20/T06)			
Direct Calibration of Infrared Radiation Thermometers	-15 °C to 0 °C	0.14 °C	Blackbody Cavities
	≥ 0 °C to 100 °C	0.12 °C	
	> 100 °C to 200 °C	0.14 °C	
	> 200 °C to 350 °C	0.23 °C	
	> 350 °C to 500 °C	0.35 °C	
	> 500 °C to 660 °C	0.60 °C	
	> 660 °C to 960 °C	1.1 °C	
Direct Calibration of Infrared Calibrators [Note 7]	-15 °C	0.20 °C	Infrared Radiation Thermometers
	0 °C to 50 °C	0.16 °C	
	50 °C	0.16 °C	
	100 °C	0.20 °C	
	120 °C	0.21 °C	
	200 °C	0.27 °C	
	250 °C	0.32 °C	

2023-09-18 through 2024-09-30
Effective dates

For the National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200348-0**

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
	350 °C	0.45 °C	
	500 °C	0.79 °C	
Dry Block Calibrators			
Contact Calibration of Infrared Calibrators	33 °C to 40 °C	30 mK	Direct Comparison to Precision Thermistor
RESISTANCE THERMOMETRY(20/T07)			
Fixed Point Schedule 1			
Direct Comparison	-197 °C	0.60 mK	LN_2 TPAr Substitution
Calibration of SPRT by Fixed Point	-189.344 °C	0.41 mK	TPAr
	-38.8344 °C	0.35 mK	TPHg
	0.010 °C	0.15 mK	TPW
	29.7646 °C	0.35 mK	MPGa
	156.599 °C	0.65 mK	FPIn
	231.928 °C	0.85 mK	FPSn
	419.527 °C	1.1 mK	FPZn
	660.323 °C	1.7 mK	FPAl
	961.78 °C	4.7 mK	FPAg
Fixed Point Schedule 2			
Routine Measurement Capability	-197 °C	0.75 mK	LN_2
	-189.344 °C	0.55 mK	TPAr
	-38.8344 °C	0.75 mK	TPHg
	0.010 °C	0.50 mK	TPW
	29.7646 °C	0.75 mK	MPGa
	156.599 °C	1.5 mK	FPIn
	231.928 °C	1.5 mK	FPSn
	419.527 °C	1.8 mK	FPZn
	660.323 °C	2.5 mK	FPAl
	961.78 °C	6.0 mK	FPAg

2023-09-18 through 2024-09-30
Effective dates

For the National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200348-0**

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty Note 3	Remarks
Fixed Point Schedule 3			
Single Power Calibration any SPRTs	-197 °C	2.0 mK	LN_2
	-189.344 °C	1.0 mK	TPAr
	-38.8344 °C	2.0 mK	TPHg
	0.010 °C	2.0 mK	TPW
	29.7646 °C	2.0 mK	MPGa
	156.599 °C	3.0 mK	FPIn
	231.928 °C	3.0 mK	FPSn
	419.527 °C	4.0 mK	FPZn
	660.323 °C	7.0 mK	FPAl
	961.78 °C	10 mK	FPAg
Fixed Point Schedule 4			
Comparison- High Quality PRTs			Single Power Calibration in Mini Fixed Points
	-197 °C	6.0 mK	LN_2
	-80 °C	6.0 mK	
	-38.8344 °C	6.0 mK	TPHg
	0.010 °C	4.0 mK	TPW
	156.599 °C	6.0 mK	FPIn
	231.928 °C	7.0 mK	FPSn
	419.527 °C	9.0 mK	FPZn
	660.323 °C	14 mK	FPAl
	961.78 °C	30 mK	FPAg
Comparison Schedule 1			
Single Power Calibration by Comparison	-197 °C	10 mK	Calibration by Comparison
High Quality PRTs	-100 °C to -50 °C	10 mK	
	-50 °C to 0 °C	8.0 mK	
	0.010 °C	8.0 mK	
	0 °C to 200 °C	9.0 mK	
	200 °C to 300 °C	13 mK	
	300 °C to 400 °C	14 mK	
	400 °C to 500 °C	17 mK	
	660.323 °C	30 mK	FPAl

2023-09-18 through 2024-09-30
Effective dates

For the National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200348-0**

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
Comparison Schedule 2			
Single Power Calibration by Comparison			
Any Quality PRTs	-197 °C	25 mK	Calibration by Comparison
	-100 °C to 300 °C	25 mK	
	> 300 °C to 420 °C	30 mK	
	> 420 °C to 500 °C	35 mK	
	660.323 °C	50 mK	
Comparison Schedule 3			
Dry Block Calibration of PRTs	-197 °C	25 mK	Comparison in LN_2
	-38 °C to 0 °C	25 mK	Comparison in Dry Block
	0 °C to 420 °C	45 mK	
	> 420 °C to 660 °C	50 mK	
Thermistors			
Precision Thermistors	0 °C to 60 °C	1.5 mK	
	> 60 °C to 100 °C	2.0 mK	
Standard Thermistors	- 30 °C to -20 °C	5.0 mK	
	-20 °C to 120 °C	4.0 mK	
Certification of Thermometric Fixed Point Cells	TPHg	0.20 mK	Direct Comparison to Reference Cells
	TPW	0.07 mK	
	MPGa	0.07 mK	
	FPIn	0.40 mK	
	FPSn	0.50 mK	
	FPZn	0.60 mK	
	FPAl	1.0 mK	
	FPAg	1.9 mK	
	TPHg	0.25 mK	Direct Comparison to Working Cells
	TPW	0.10 mK	
	MPGa	0.10 mK	
	FPIn	0.60 mK	
	FPSn	0.75 mK	
	FPZn	0.75 mK	

2023-09-18 through 2024-09-30
Effective dates

For the National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200348-0**

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Expanded Uncertainty [Note 3]	Remarks
	FPAl	1.2 mK	
	FPAg	2.5 mK	
Dry Block Calibrators	-100 °C to 155.0 °C	0.024 °C	Direct Comparison to PRT
	> 155 °C to 250 °C	0.032 °C	
	> 250 °C to 425 °C	0.043 °C	
	> 425 °C to 500 °C	0.050 °C	
	> 500 °C to 660 °C	0.062 °C	
THERMOCOUPLES (20/T11)			
High Quality Thermocouples			
Type S and Type R	156.599 °C	0.10 °C	FPIn
	231.928 °C	0.10 °C	FPSn
	419.527 °C	0.13 °C	FPZn
	660.323 °C	0.18 °C	FPAl
	961.78 °C	0.25 °C	FPAg
Gold vs. Platinum	0.010 °C	25 mK	TPW
	156.599 °C	20 mK	FPIn
	231.928 °C	20 mK	FPSn
	419.527 °C	20 mK	FPZn
	660.323 °C	25 mK	FPAl
	961.78 °C	35 mK	FPAg
	1000.00 °C	40 mK	Extrapolated
END			

2023-09-18 through 2024-09-30
Effective dates

For the National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200348-0**

Notes

Note 1: A Calibration and Measurement Capability (CMC) is a description of the best result of a calibration or measurement (result with the smallest uncertainty of measurement) that is available to the laboratory's customers under normal conditions, when performing more or less routine calibrations of nearly ideal measurement standards or instruments. The CMC is described in the laboratory's scope of accreditation by: the measurement parameter/device being calibrated, the measurement range, the uncertainty associated with that range (see note 3), and remarks on additional parameters, if applicable.

Note 2: Calibration and Measurement Capabilities are traceable to the national measurement standards of the U.S. or to the national measurement standards of other countries and are thus traceable to the internationally accepted representation of the appropriate SI (Système International) unit.

Note 3: The uncertainty associated with a measurement in a CMC is an expanded uncertainty with a level of confidence of approximately 95 %, typically using a coverage factor of $k = 2$. However, laboratories may report a coverage factor different than $k = 2$ to achieve the 95 % level of confidence. Units for the measurand and its uncertainty are to match. Exceptions to this occur when marketplace practice employs mixed units, such as when the artifact to be measured is labeled in non-SI units and the uncertainty is given in SI units (Example: 5 lb weight with uncertainty given in mg) .

Note 3a: The uncertainty of a specific calibration by the laboratory may be greater than the uncertainty in the CMC due to the condition and behavior of the customer's device and specific circumstances of the calibration. The uncertainties quoted do not include possible effects on the calibrated device of transportation, long term stability, or intended use.

Note 3b: As the CMC represents the best measurement results achievable under normal conditions, the accredited calibration laboratory shall not report smaller uncertainty of measurement than that given in a CMC for calibrations or measurements covered by that CMC.

Note 3c: As described in Note 1, CMCs cover calibrations and measurements that are available to the laboratory's customers under *normal conditions.* However, the laboratory may have the capability to offer special tests, employing special conditions, which yield calibration or measurement results with lower uncertainties. Such special tests are not covered by the CMCs and are outside the laboratory's scope of accreditation. In this case, NVLAP requirements for the labeling, on calibration reports, of results outside the laboratory's scope of accreditation apply. These requirements are set out in Annex A.5 of NIST Handbook 150, Procedures and General Requirements.

Note 4: Uncertainties associated with field service calibration may be greater as they incorporate on-site environmental contributions, transportation effects, or other factors that affect the measurements. (This note applies only if marked in the body of the scope.)

Note 5: Calibration values listed with percent (%) are percent of reading or generated value unless otherwise noted.

Note 6: NVLAP accreditation is the formal recognition of specific calibration capabilities. Neither NVLAP nor NIST guarantee the accuracy of individual calibrations made by accredited laboratories.

Note 7: Uncertainty between points to be linearly interpolated from adjacent points. Calibration is performed over the spectral band of 8 µm to 14 µm.

Note 8: Calibration of used thermocouples may result in larger uncertainties due to increased inhomogeneity.

2023-09-18 through 2024-09-30
Effective dates

For the National Voluntary Laboratory Accreditation Program