PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

Lake Balance Calibration Solutions

7722 Metric Drive, Mentor, OH 44060

(Hereinafter called the Organization) and hereby declares that Organization is accredited in accordance with the recognized International Standard:

ISO/IEC 17025:2017
ANSI/NCSL Z540-1-1994

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system
(as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

Chemical, Dimensional, Electrical, Mechanical, Thermodynamic, Time and Frequency, and Mass, Force and Weighing Device Calibration
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President

Perry Johnson Laboratory Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

Initial Accreditation Date:	*Issue Date:*	*Expiration Date:*
March 07, 2020	August 18, 2022	November 30, 2024

Accreditation No.:	*Certificate No.:*
97175	L22-566-1

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

Certificate of Accreditation: Supplement

Lake Balance Calibration Solutions

7722 Metric Drive, Mentor, OH, 44060
Contact Name: Mark Hanson Phone: 440-299-4811

Accreditation is granted to the facility to perform the following calibrations:

Dimensional

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Calipers FO	Up to 40 in	(12L + 150) µin	Gage Blocks / Surface Plate SOP-01 Micrometer Calibration SOP-02 Caliper Calibration SOP-06 Height Gage Calibration SOP-12 Dial and Digital Indicator Calibration
Micrometers FO	Up to 6 in	(9.2L + 21) µin	
	6 in to 20 in	(16L + 177) µin	
Indicators, Dial, Test FO	Up to 4 in	(30L - 5.5) µin	
Height Gages FO	Up to 48 in	(10L + 205) µin	
Optical Comparators X and Y Axis Linearity FO	Up to 12 in	200 µin	Gage Line Glass Standard SOP-37 Optical Comparators
Optical Comparators Magnification FO	10 x, 20 x, 31.25 x, 50 x, 62.5 x, 100 x	200 µin	
Optical Comparators Angle FO	0°, 5°, 10°, 15°, 20°, 25°, 30°, 45°, 90°	0.10°	Gage Line Glass Standard and Angle Blocks SOP-37 Optical Comparators

Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure DC Voltage FO	Up to 100 mV	1.8 µV	HP 3458A Opt 002 GIDEP / OEM Manual
	100 mV to 1 V	7 µV	
	1 V to 10 V	72 µV	
	10 V to 100 V	1.2 mV	
	100 V to 1 kV	30 mV	
	1 kV to 4 kV	2.2 V	Vitrek 4700 GIDEP / OEM Manual
	4 kV to 10 kV	3.9 V	
	10 kV to 30 kV	0.027 kV	Vitrek 4700, Vitrek HVL-100 GIDEP / OEM Manual
	30 kV to 50 kV	0.045 kV	
	50 kV to 100 kV	0.15 kV	
Equipment to Output DC Voltage FO	Up to 330 mV	8.2 µV	Fluke 5522A GIDEP / OEM Manual
	330 mV to 3.3 V	41 µV	
	3.3 V to 33 V	0.45 mV	
	33 V to 330 V	6.5 mV	
	330 V to 1 kV	23 mV	
Equipment to Measure DC Current FO	Up to 100 µA	7.4 nA	HP 3458A Opt 002 GIDEP / OEM Manual
	100 µA to 1 mA	84 nA	
	1 mA to 10 mA	0.71 µA	
	10 mA to 100 mA	10 µA	
	100 mA to 1 A	0.16 mA	

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Equipment to Measure DC Current [FO]	1 A to 3 A	11 mA	HP 3458A Opt 002, HP 34330A Shunt GIDEP/OEM Manual
	3 A to 11 A	40 mA	
	11 A to 20.5 A	73 mA	
Equipment to Source DC Current [FO]	Up to 330 µA	0.11 µA	Fluke 5522A GIDEP/OEM Manual
	330 µA to 3.3 mA	0.56 µA	
	3.3 mA to 33 mA	9.1 µA	
	33 mA to 330 mA	87 µA	
	330 mA to 1.1 A	0.29 mA	
	1.1 A to 3 A	1.3 mA	
	3 A to 11 A	7.1 mA	
	11 A to 20.5 A	25 mA	
Equipment to Measure AC Voltage At the listed frequencies [FO]			HP 3458A Opt 002 GIDEP/OEM Manual
Up to 1 kHz	Up to 10 mV	4.7 µV	
1 kHz to 20 kHz	Up to 10 mV	9 µV	
20 kHz to 100 kHz	Up to 10 mV	90 µV	
100 kHz to 300 kHz	Up to 10 mV	0.72 mV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
Up to 1 kHz	10 mV to 100 mV	12 µV	
1 kHz to 20 kHz	10 mV to 100 mV	20 µV	
20 kHz to 100 kHz	10 mV to 100 mV	0.1 mV	
100 kHz to 300 kHz	10 mV to 100 mV	0.39 mV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
Up to 1 kHz	100 mV to 1 V	0.12 mV	
1 kHz to 20 kHz	100 mV to 1 V	0.2 mV	
20 kHz to 50 kHz	100 mV to 1 V	0.39 mV	
50 kHz to 100 kHz	100 mV to 1 V	0.97 mV	
100 kHz to 300 kHz	100 mV to 1 V	3.6 mV	
300 kHz to 500 kHz	100 mV to 1 V	12 mV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
Up to 10 Hz	1 V to 10 V	3.8 mV	
10 Hz to 20 Hz	1 V to 10 V	1.4 mV	

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Equipment to Measure AC Voltage At the listed frequencies [FO]			HP 3458A Opt 002 GIDEP/OEM Manual
20 Hz to 40 Hz	1 V to 10 V	1.2 mV	
40 Hz to 1 kHz	1 V to 10 V	1.2 mV	
1 kHz to 10 kHz	1 V to 10 V	2 mV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
10 kHz to 20 kHz	1 V to 10 V	2 mV	
20 kHz to 50 kHz	1 V to 10 V	3.9 mV	
50 kHz to 100 kHz	1 V to 10 V	9.6 mV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
Up to 1 kHz	10 V to 100 V	27 mV	
1 kHz to 20 kHz	10 V to 100 V	28 mV	
20 kHz to 50 kHz	10 V to 100 V	45 mV	
50 kHz to 100 kHz	10 V to 100 V	0.15 V	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
Up to 20 kHz	100 V to 1 kV	0.36 V	
Equipment to Measure AC Voltage At the listed frequencies [FO]			Vitrek 4700 GIDEP/OEM Manual
60 Hz	1 kV to 10 kV	0.021 kV	
60 Hz	10 kV to 75 kV	0.18 kV	Vitrek 4700, Vitrek HVL-100 GIDEP/OEM Manual
Equipment to Source AC Voltage At the listed frequencies [FO]			Fluke 5522A GIDEP/OEM Manual
10 Hz to 45 Hz	Up to 33 mV	35 µV	
45 Hz to 10 kHz	Up to 33 mV	12 µV	
10 kHz to 20 kHz	Up to 33 mV	14 µV	
20 kHz to 50 kHz	Up to 33 mV	42 µV	
50 kHz to 100 kHz	Up to 33 mV	0.14 mV	
100 kHz to 500 kHz	Up to 33 mV	0.34 mV	
Equipment to Source AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	33 mV to 330 mV	0.12 mV	
45 Hz to 10 kHz	33 mV to 330 mV	60 µV	
10 kHz to 20 kHz	33 mV to 330 mV	65 µV	

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Equipment to Source AC Voltage At the listed frequencies [FO]			Fluke 5522A GIDEP/OEM Manual
20 kHz to 50 kHz	33 mV to 330 mV	0.13 mV	
50 kHz to 100 kHz	33 mV to 330 mV	0.32 mV	
Equipment to Source AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	330 mV to 3.3 V	11 mV	
45 Hz to 10 kHz	330 mV to 3.3 V	0.59 mV	
10 kHz to 20 kHz	330 mV to 3.3 V	0.73 mV	
20 kHz to 50 kHz	330 mV to 3.3 V	1.1 mV	
50 kHz to 100 kHz	330 mV to 3.3 V	2.9 mV	
100 kHz to 500 kHz	330 mV to 3.3 V	9.1 mV	
Equipment to Source AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	3.3 V to 33 V	11 mV	
45 Hz to 10 kHz	3.3 V to 33 V	5.9 mV	
10 kHz to 20 kHz	3.3 V to 33 V	9.1 mV	
20 kHz to 50 kHz	3.3 V to 33 V	13 mV	
50 kHz to 100 kHz	3.3 V to 33 V	33 mV	
Equipment to Source AC Voltage At the listed frequencies [FO]			
45 Hz to 1 kHz	33 V to 330 V	69 mV	
1 kHz to 10 kHz	33 V to 330 V	79 mV	
10 kHz to 20 kHz	33 V to 330 V	94 mV	
20 kHz to 50 kHz	33 V to 330 V	0.12 V	
50 kHz to 100 kHz	33 V to 330 V	0.53 V	
Equipment to Source AC Voltage At the listed frequencies [FO]			
45 Hz to 1 kHz	330 V to 1.02 kV	0.34 V	
1 kHz to 5 kHz	330 V to 1.02 kV	0.28 V	
5 kHz to 10 kHz	330 V to 1.02 kV	0.33 V	
Equipment to Source AC Current At the Listed frequencies [FO]			Fluke 5522A GIDEP/OEM Manual
10 Hz to 20 Hz	29 µA to 330 µA	0.82 µA	
20 Hz to 45 Hz	29 µA to 330 µA	0.64 µA	
45 Hz to 1 kHz	29 µA to 330 µA	0.55 µA	

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Equipment to Source AC Current At the listed frequencies [FO]			Fluke 5522A GIDEP/OEM Manual
1 kHz to 5 kHz	29 µA to 330 µA	1.2 µA	
5 kHz to 10 kHz	29 µA to 330 µA	3 µA	
10 kHz to 30 kHz	29 µA to 330 µA	6 µA	
Equipment to Source AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	330 µA to 3.3 mA	7.6 µA	
20 Hz to 45 Hz	330 µA to 3.3 mA	4.8 µA	
45 Hz to 1 kHz	330 µA to 3.3 mA	3.9 µA	
1 kHz to 5 kHz	330 µA to 3.3 mA	8 µA	
5 kHz to 10 kHz	330 µA to 3.3 mA	19 µA	
10 kHz to 30 kHz	330 µA to 3.3 mA	38 µA	
Equipment to Source AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	3.3 mA to 33 mA	66 µA	
20 Hz to 45 Hz	3.3 mA to 33 mA	34 µA	
45 Hz to 1 kHz	3.3 mA to 33 mA	17 µA	
1 kHz to 5 kHz	3.3 mA to 33 mA	32 µA	
5 kHz to 10 kHz	3.3 mA to 33 mA	74 µA	
10 kHz to 30 kHz	3.3 mA to 33 mA	0.14 mA	
Equipment to Source AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	33 mA to 330 mA	0.65 mA	
20 Hz to 45 Hz	33 mA to 330 mA	0.34 mA	
45 Hz to 1 kHz	33 mA to 330 mA	0.16 mA	
1 kHz to 5 kHz	33 mA to 330 mA	0.41 mA	
5 kHz to 10 kHz	33 mA to 330 mA	0.81 mA	
10 kHz to 30 kHz	33 mA to 330 mA	1.6 mA	
Equipment to Source AC Current At the listed frequencies [FO]			
10 Hz to 45 Hz	330 mA to 1.1 A	2.2 mA	
45 Hz to 1 kHz	330 mA to 1.1 A	0.71 mA	
1 kHz to 5 kHz	330 mA to 1.1 A	8.1 mA	
5 kHz to 10 kHz	330 mA to 1.1 A	35 mA	

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Equipment to Source AC Current At the listed frequencies [FO]			Fluke 5522A GIDEP/OEM Manual
10 Hz to 45 Hz	1.1 A to 3 A	6.2 mA	
45 Hz to 1 kHz	1.1 A to 3 A	2.2 mA	
1 kHz to 5 kHz	1.1 A to 3 A	21 mA	
Equipment to Source AC Current At the listed frequencies [FO]			
45 Hz to 100 Hz	3 A to 11 A	10 mA	
100 Hz to 1 kHz	3 A to 11 A	15 mA	
1 kHz to 5 kHz	3 A to 11 A	0.38 A	
Equipment to Source AC Current At the listed frequencies [FO]			
45 Hz to 100 Hz	11 A to 20.5 A	34 mA	
100 Hz to 1 kHz	11 A to 20.5 A	41 mA	
1 kHz to 5 kHz	11 A to 20.5 A	0.7 A	
Equipment to Measure AC Current At the listed frequencies [FO]			HP 3458A Opt 002 GIDEP/OEM Manual
10 Hz to 5 kHz	Up to 100 µA	0.11 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 5 kHz	100 µA to 1 mA	0.6 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 5 kHz	1 mA to 10 mA	6.1 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 5 kHz	10 mA to 100 mA	61 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 5 kHz	100 mA to 1.1 A	1.4 mA	
Equipment to Measure AC Current At the listed frequencies [FO]			HP 3458A Opt 002 with HP 34330A Shunt GIDEP/OEM Manual
10 Hz to 40 Hz	1.1 A to 3.3 A	13 mA	
40 Hz to 1 kHz	1.1 A to 3.3 A	12 mA	
1 kHz to 5 kHz	1.1 A to 3.3 A	0.2 A	

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Equipment to Measure AC Current At the listed frequencies FO			HP 3458A Opt 002 with HP 34330A Shunt GIDEP/OEM Manual
45 Hz to 1 kHz	3 A to 11 A	43 mA	
45 Hz to 1 kHz	3 A to 11 A	43 mA	
Equipment to Measure AC Current At the listed frequencies FO			
45 Hz to 1 kHz	11 A to 20.5 A	12 mA	
1 kHz to 5 kHz	11 A to 20.5 A	0.2 A	
Equipment to Source Inductance FO	100 µH to 1 mH	17 µH	GR 1491D Decade Box RLC GenRad 1689 GIDEP / OEM Manual
	1 mH to 10 mH	0.14 mH	
	10 mH to 100 mH	0.69 mH	
	100 mH to 1 H	6.9 mH	
	1 H to 10 H	69 mH	
Equipment to Measure Inductance FO	100 µH to 1 mH	0.24 µH	RLC GenRad 1689 GIDEP / OEM Manual
	1 to 10 mH	2.4 µH	
	10 mH to 100 mH	24 µH	
	100 mH to 1 H	0.24 mH	
	1 H to 10 H	2.3 mH	
Equipment to Measure Capacitance FO	Up to 1 nF	0.64 pF	RLC GenRad 1689 GIDEP / OEM Manual
	1 nF to 10 nF	2.4 pF	
	10 nF to 100 nF	26 pF	
	100 nF to 1 µF	0.41 nF	
	1 µF to 1.111 µF	0.44 nF	
Equipment to Source Capacitance At the listed frequencies FO			1423A Decade Box GIDEP / OEM Manual
20 Hz to 1 kHz	100 pF to 1 nF	0.67 pF	
20 Hz to 1 kHz	1 nF to 10 nF	42 pF	
20 Hz to 1 kHz	10 nF to 100 nF	74 pF	
20 Hz to 1 kHz	100 nF to 1 µF	0.62 nF	
10 Hz to 10 kHz	220 pF to 400 pF	15 pF	Fluke 5522A GIDEP / OEM Manual
10 Hz to 10 kHz	0.4 nF to 1.1 nF	18 pF	
10 Hz to 3 kHz	1.1 nF to 3.3 nF	23 pF	
10 Hz to 1 kHz	3.3 nF to 11 nF	44 pF	
10 Hz to 1 kHz	11 nF to 33 nF	0.17 nF	
10 Hz to 1 kHz	33 nF to 110 nF	0.44 nF	

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Equipment to Source Capacitance At the listed frequencies [FO]			Fluke 5522A GIDEP / OEM Manual
10 Hz to 1 kHz	110 nF to 330 nF	0.92 nF	
10 Hz to 600 Hz	330 nF to 1.1 µF	4.1 nF	
10 Hz to 300 Hz	1.1 µF to 3.3 µF	12 nF	
10 Hz to 150 Hz	3.3µF to 11 µF	44 nF	
10 Hz to 120 Hz	11 µF to 33 µF	0.18 µF	
10 Hz to 80 Hz	33 µF to 110 µF	0.7 µF	
0 Hz to 50 Hz	110 µF to 330 µF	2 µF	
Equipment to Source Capacitance At the listed frequencies [FO]			Fluke 5522A GIDEP / OEM Manual
0 Hz to 20 Hz	330 µF to 1.1 mF	12 µF	
0 Hz to 6 Hz	1.1 mF to 3.3 mF	20 µF	
0 Hz to 2 Hz	3.3 mF to 11 mF	89 µF	
0 Hz to 0.6 Hz	11 mF to 33 mF	0.31 mF	
0 Hz to 0.2 Hz	33 mF to 110 mF	1.4 mF	
Equipment to Source DC Resistance [FO]	Up to 10 Ω	1.6 mΩ	ESI RS925A Resistance Decade Box GIDEP / OEM Manual
	10 Ω to 100 Ω	3.1 mΩ	
	100 Ω to 1 kΩ	27 mΩ	
	1 kΩ to 10 kΩ	0.26 Ω	
	10 kΩ to 100 kΩ	2.6 Ω	
	100 kΩ to 1.1 MΩ	29 Ω	
	Up to 10 Ω	1.6 mΩ	Fluke 5522A GIDEP / OEM Manual
	1.1 MΩ to 3.3 MΩ	0.29 kΩ	
	3.3 MΩ to 11 MΩ	0.35 kΩ	
	11 MΩ to 33 MΩ	12 kΩ	
	33 MΩ to 110 MΩ	66 kΩ	
	110 MΩ to 330 MΩ	1.2 MΩ	
	330 MΩ to 1.1 GΩ	18 MΩ	
Equipment to Measure DC Resistance [FO]	Up to 10 Ω	0.31 mΩ	HP 3458A Opt 002 GIDEP / OEM Manual
	10 Ω to 100 Ω	2.7 mΩ	
	100 Ω to 1 kΩ	18 mΩ	
	1 kΩ to 10 kΩ	0.18 Ω	
	10 kΩ to 100 kΩ	1.8 Ω	

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Equipment to Measure DC Resistance [FO]	100 kΩ to 1 MΩ	25 Ω	HP 3458A Opt 002 GIDEP/OEM Manual
	1 MΩ to 10 MΩ	0.78 kΩ	
	10 MΩ to 100 MΩ	68 kΩ	
Oscilloscopes Amplitude – DC [FO]			Fluke 5522A / SC1100 GIDEP/OEM Manual
50 Ω	-6.6 V to 6.6 V	20 mV	
1 MΩ	-130 V to 130 V	15 mV	
Amplitude - Square Wave [FO]			
50 Ω	1 mV to 6.6 V (p-p)	13 mV	
1 MΩ	1 mV to 130 V (p-p)	18 mV	
Frequency	10 Hz to 10 kHz	29 Hz	
Time Markers into 50 Ω Load	1 ns to 20 ms	8.2 µs	
	50 ms to 5 s	29 ms	
Leveled Sine Wave (5 mV to 5.5 V) p-p	50 kHz reference	0.13 V	
	50 kHz to 100 MHz	0.1 V	
	100 MHz to 300 MHz	0.14 V	
	300 MHz to 600 MHz	0.26 V	
Leveled Sine Wave (5 mV to 3.5 V) p-p	600 MHz to 1.1 GHz	0.2 V	
Edge Characteristics into 50 Ω Load Rise Time Amplitude Frequency	Up to 300 ps	+0/-120 ps	
	4.5 mV to 2.75 V	63 mV	
	1 kHz to 10 MHz	29 Hz	
Wave Generator Square, Sine, Triangle Amplitude Into 50 Ω Load Into 1 MΩ Load Frequency	1.8 mV to 55 V p-p	88 mV	
	1.8 mV to 55 V p-p	2 V	
	10 Hz to 100 kHz	0.29 Hz	
Pulse – Generate 50 Ω Load Period Width	22 ms to 200 ns 45.5 Hz to 5 MHz	6.1 ns	
	4 ns to 500 ns	1.2 ns	
Input Resistance Measurement	40 Ω to 60 Ω	56 mΩ	
	500 kΩ to 1.5MΩ	2.5 kΩ	
Oscilloscope Capacitance Measurement	5 pF to 50 pF	1.3 pF	

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Electrical Simulation of Thermocouple Indicators Type B [FO]	600 °C to 800 °C	0.53 °C	Fluke 5522A GIDEP/OEM Manual
	800 °C to 1 000 °C	0.42 °C	
	1 000 °C to 1 550 °C	0.37 °C	
	1 550 °C to 1 820 °C	0.4 °C	
Electrical Simulation of Thermocouple Indicators Type C [FO]	0 °C to 150 °C	0.35 °C	
	150 °C to 650 °C	0.31 °C	
	650 °C to 1 000 °C	0.38 °C	
	1 000 °C to 1 800 °C	0.59 °C	
	1 800 °C to 2 316 °C	0.98 °C	
Electrical Simulation of Thermocouple Indicators Type E [FO]	-250 °C to -100 °C	0.58 °C	
	-100 °C to -25 °C	0.19 °C	
	-25 °C to 350 °C	0.17 °C	
	350 °C to 650 °C	0.19 °C	
	650 °C to 1 000 °C	0.25 °C	
Electrical Simulation of Thermocouple Indicators Type J [FO]	-210 °C to -100 °C	0.33 °C	
	-100 °C to -30 °C	0.2 °C	
	-30 °C to 150 °C	0.17 °C	
	150 °C to 760 °C	0.21 °C	
	760 °C to 1 200 °C	0.27 °C	
Electrical Simulation of Thermocouple Indicators Type K [FO]	-200 °C to -100 °C	0.39 °C	
	-100 °C to -25 °C	0.22 °C	
	-25 °C to 120 °C	0.19 °C	
	120 °C to 1 000 °C	0.31 °C	
	1 000 °C to 1 372 °C	0.48 °C	
Electrical Simulation of Thermocouple Indicators Type L [FO]	-200 °C to -100 °C	0.44 °C	
	-100 °C to 800 °C	0.32 °C	
	800 °C to 900 °C	0.22 °C	
Electrical Simulation of Thermocouple Indicators Type N [FO]	-200 °C to -100 °C	0.47 °C	
	-100 °C to -25 °C	0.26 °C	
	-25 °C to 120 °C	0.23 °C	
	120 °C to 410 °C	0.22 °C	
	410 °C to 1 300 °C	0.33 °C	

Certificate of Accreditation: Supplement

Lake Balance Calibration Solutions
7722 Metric Drive, Mentor, OH, 44060
Contact Name: Mark Hanson Phone: 440-229-4811

Accreditation is granted to the facility to perform the following calibrations:

Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Electrical Simulation of Thermocouple Indicators Type R [FO]	0 °C to 250 °C	0.67 °C	Fluke 5522A GIDEP/OEM Manual
	250 °C to 400 °C	0.42 °C	
	400 °C to 1 000 °C	0.4 °C	
	1 000 °C to 1 767 °C	0.48 °C	
Electrical Simulation of Thermocouple Indicators Type S [FO]	0 °C to 250 °C	0.56 °C	
	250 °C to 1 000 °C	0.43 °C	
	1 000 °C to 1 400 °C	0.44 °C	
	1 400 °C to 1 767 °C	0.54 °C	
Electrical Simulation of Thermocouple Indicators Type T [FO]	-250 °C to -150 °C	0.74 °C	
	-150 °C to 0 °C	0.3 °C	
	0 °C to 120 °C	0.19 °C	
	120 °C to 400 °C	0.17 °C	
Electrical Simulation of Thermocouple Indicators Type U [FO]	-200 °C to 0 °C	0.66 °C	
	0 °C to 600 °C	0.33 °C	
Electrical Simulation of RTD Indicators Pt 385, 100 Ω [FO]	-200 °C to -80 °C	0.06 °C	
	-80 °C to 0 °C	0.06 °C	
	0 °C to 100 °C	0.09 °C	
	100 °C to 300 °C	0.11 °C	
	300 °C to 400 °C	0.12 °C	
	400 °C to 630 °C	0.14 °C	
	630 °C to 800 °C	0.27 °C	
Electrical Simulation of RTD Indicators Pt 385, 200 Ω [FO]	-200 °C to -80 °C	0.05 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.05 °C	
	100 °C to 260 °C	0.06 °C	
	260 °C to 300 °C	0.15 °C	
	300 °C to 400 °C	0.18 °C	
	400 °C to 600 °C	0.18 °C	
	600 °C to 630°C	0.19 °C	

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Electrical Simulation of RTD Indicators Pt 385, 500 Ω FO	-200 °C to -80 °C	0.05 °C	Fluke 5522A GIDEP/OEM Manual
	-80 °C to 0 °C	0.06 °C	
	0 °C to 100 °C	0.06 °C	
	100 °C to 260 °C	0.07 °C	
	260 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.09 °C	
	400 °C to 600 °C	0.11 °C	
	600 °C to 630 °C	0.13 °C	
Electrical Simulation of RTD Indicators Pt 385, 1000 Ω FO	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.04 °C	
	0 °C to 100 °C	0.08 °C	
	100 °C to 260 °C	0.06 °C	
	260 °C to 300 °C	0.07 °C	
	300 °C to 400 °C	0.08 °C	
	400 °C to 600 °C	0.08 °C	
	600 °C to 630 °C	0.27 °C	
Phase Angle - Source (0 to 360)° FO	65 Hz to 500 Hz	0.29 °	Fluke 5522A GIDEP/OEM Manual
Equipment to measure RF Power at listed Frequencies FO			
150 kHz to 1.3 GHz	-20 dBm to 30 dBm	0.21 dBm	HP 8902A / HP 11722A GIDEP/OEM Manual
1.3 GHz to 18 GHz	-70 dBm to 10 dBm	0.23 dBm	AGILENT E4418B / E4412A GIDEP/OEM Manual
	10 dBm to 20 dBm	0.16 dBm	
Tuned RF Absolute Power – Measure 2.5 MHz to 1.3 GHz FO	-20 dBm to 10 dBm	0.15 dBm	HP 8902A / HP 11722A GIDEP/OEM Manual
	-40 dBm to -20 dBm	0.16 dBm	
	-50 dBm to -40 dBm	0.11 dBm	
	-60 dBm to -50 dBm	0.07 dBm	
	-70 dBm to -60 dBm	0.11 dBm	
	-80 dBm to -70 dBm	0.11 dBm	
	-90 dBm to -80 dBm	0.07 dBm	
	-100 dBm to -90 dBm	0.07 dBm	
	-110 dBm to -100 dBm	0.16 dBm	
	-120 dBm to -110 dBm	0.13 dBm	
	-127 dBm to -120 dBm	0.13 dBm	

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Lake Balance Calibration Solutions
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Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure Amplitude Modulation at the listed Frequencies and Rates [FO]			
Frequency: 150 kHz to 10 MHz Rate: 50 Hz to 10 kHz	5 % to 99 %	2.3 %	HP 8902A GIDEP/OEM Manual
Frequency: 150 kHz to 10 MHz Rate: 20 Hz to 10 kHz	to 99 %	3.5 %	
Frequency: 10 MHz to 1.3 GHz Rate: 50 Hz to 50 kHz	5 % to 99 %	1.2 %	
Frequency: 10 MHz to 1.3 GHz Rate: 20 Hz to 100 kHz	to 99 %	3.5 %	
Equipment to Measure Frequency Modulation at the listed Frequencies and Rates [FO]			HP 8902A GIDEP/OEM Manual
Frequency: 250 kHz to 10 MHz Rate: 20 Hz to 10 kHz ≤ 40 kHz peak	0 Hz to 4 kHz	0.12 kHz	
	4 kHz to 40 kHz	1.1 kHz	
Frequency: 10 MHz to 1.3 GHz Rate: 50 Hz to 100 kHz ≤ 400 kHz peak	0 Hz to 4 kHz	0.18 kHz	
	4 kHz to 40 kHz	0.64 kHz	
	40 kHz to 400 kHz	4.8 kHz	
Frequency: 10 MHz to 1.3 GHz Rate: 20 Hz to 200 kHz ≤ 400 kHz peak	0 Hz to 4 kHz	0.3 kHz	
	4 kHz to 40 kHz	2.5 kHz	
	40 kHz to 400 kHz	24 kHz	
Equipment to Measure Phase Modulation at the listed Frequencies [FO]			
150 kHz to 10 MHz	0 to 2π rad	0.32 rad	
10 MHz to 1.3 GHz	0 to 2π rad	0.56 rad	

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Accreditation is granted to the facility to perform the following calibrations:

Thermodynamic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to measure Humidity FO	Up to 10 % RH	1.4 %	Vaisala HMT 333 / HMP75 Thunder Scientific 2500 SOP-16 Temperature and Humidity Calibration
	10 % RH to 95 % RH	0.71 %	
Equipment to measure Temperature FO	-196 °C	0.021 °C	Liquid Nitrogen Temperature Bath Fluke 5628 PRT HP 3458A Opt 002 SOP-03 Temperature Calibration
	-95 °C to -20 °C	0.021 °C	
	-20 °C to 150 °C	0.017 °C	
	150 °C to 660 °C	0.062 °C	

Time and Frequency

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to source Frequency – Source FO	1 MHz to 3 GHz	29 parts in 10^{10}	HP E4422B Signal Generator locked to FS725 Rubidium Frequency Standard GIDEP/OEM Manual
Equipment to measure Frequency FO	0.1 GHz to 3 GHz	28 parts in 10^{10}	HP 53132A GIDEP/OEM Manual
Equipment to measure Rotational Speed FO	0 rpm to 8 000 rpm	3.8 rpm	Reference Tachometer SOP-39 Tachometer Calibration
Timers and Stopwatches F	Up to 3 600 s	0.0072 s	HP 53132 NIST 960-12
	3 600 s to 10 800 s	0.059 s	
	Up to 24 Hours	0.25 s	

Mechanical

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MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Pressure Gages & Transducers [FO]	-1 psig to 1 psig	0.000 24 psig	Fluke 7250LP SOP-07 Pressure and Vacuum Calibration
	1 psig to 5 psig	0.03 % of reading	Fluke PM600-A1.4M with Fluke 6270A Pressure Controller SOP-07 Pressure and Vacuum Calibration
	5 psig to 200 psig	0.015 % of reading	
	200 psig to 20 000 psig	0.012 % of reading	Fluke 93116 Deadweight Tester SOP-07 Pressure and Vacuum Calibration
Equipment to measure Vacuum [FO]	Up to 14.7 psia	0.03 % of reading	Druck DPI 145 SOP-07 Pressure and Vacuum Calibration
Equipment to measure Vacuum [F]	Up to 5 psia	0.000 15 psia	Fluke PG7601 Deadweight Tester, 10 kPa/kg SOP-07 Pressure and Vacuum Calibration
	5 to 10 psia	0.000 24 psia	Fluke PG7601 Deadweight Tester, 10 kPa/kg SOP-07 Pressure and Vacuum Calibration
	10 to 14.7 psia	0.000 31 psia	Fluke PG7601 Deadweight Tester, 10 kPa/kg SOP-07 Pressure and Vacuum Calibration

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Lake Balance Calibration Solutions
7722 Metric Drive, Mentor, OH, 44060
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Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to measure Mass Flow [FO]	0.5 sccm to 50 sccm	0.31 % of reading	Mesa Labs ML-800-3 SOP-03 Mass Flowmeter Calibration /OEM Manual
	50 sccm to 5 000 sccm	0.16 % of reading	Mesa Labs ML-800-24 SOP-03 Mass Flowmeter Calibration / OEM Manual
	5 slpm to 100 slpm	0.18 % of reading	Mesa Labs ML-800-75 SOP-03 Mass Flowmeter Calibration / OEM Manual
	100 slpm to 5 000 slpm	0.28 % of reading	Fluke molbox+ mass flow terminal and Fluke 5E2-S, 2E3-S, or 1E4-S molbloc. SOP-03 Mass Flowmeter Calibration / OEM Manual
Equipment to measure Mass Flow [FO]	0.5 sccm to 50 sccm	0.31 % of reading	Mesa Labs ML-800-3 SOP-03 Mass Flowmeter Calibration / OEM Manual
Equipment to measure Liquid Flow [FO]	1 gpm to 60 gpm	0.45 % of reading	Cox Liquid Flow Standard SOP-34 Liquid Flow Calibration / OEM Manual
Equipment to masure Liquid Flow [F]	60 GPM to 225 GPM	0.74% of Reading	Hoffer HO2X2A Flow Meter SOP-34 Liquid Flow Calibration / OEM Manual
Equipment to Source Torque [FO]	2.5 in-lb to 500 in-lb 41.6 ft-lb to 800 ft-lb	0.1 % of reading	Torque Arms, F Class Weights SOP-28 Torque Transducers / OEM Manual
Torque Tools [FO]	0.12 in-lb to 1.25 in-lb	0.6 % of reading	Mountz BMX20Z SOP-04 Torque Tool Calibration / OEM Manual
	1.25 in-lb to 10 in-lb	0.59 % of reading	Mountz TL10i SOP-04 Torque Tool Calibration / OEM Manual
	10 in-lb to 500 in-lb	0.3 % of reading	Norbar 50621 SOP-04 Torque Tool Calibration / OEM Manual
	42 ft-lb to 75 ft-lb	0.31 % of reading	Norbar 50593 SOP-04 Torque Tool Calibration / OEM Manual
	75 ft-lb to 750 ft-lb	0.31 % of reading	Norbar 50597 SOP-04 Torque Tool Calibration / OEM Manual

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Equipment to measure Pressure [F]	1 to 5 psig	0.000 15 psig	Fluke PG7601 Deadweight Tester, 10 kPa/kg SOP-07 Pressure and Vacuum Calibration
	5 to 10 psig	0.000 24 psig	Fluke PG7601 Deadweight Tester, 10 kPa/kg SOP-07 Pressure and Vacuum Calibration
	10 to 15 psig	0.000 31 psig	Fluke PG7601 Deadweight Tester, 10 kPa/kg SOP-07 Pressure and Vacuum Calibration
	15 to 30 psig	0.000 37 psig	Fluke PG7601 Deadweight Tester, 10 kPa/kg SOP-07 Pressure and Vacuum Calibration
	30 to 50 psig	0.000 58 psig	Fluke PG7601 Deadweight Tester, 10 kPa/kg SOP-07 Pressure and Vacuum Calibration
	50 to 100 psig	0.001 9 psig	Fluke PG7601 Deadweight Tester, 200 kPa/kg SOP-07 Pressure and Vacuum Calibration
	100 to 150 psig	0.002 7 psig	Fluke PG7601 Deadweight Tester, 200 kPa/kg SOP-07 Pressure and Vacuum Calibration
	150 to 200 psig	0.004 2 psig	Fluke PG7601 Deadweight Tester, 200 kPa/kg SOP-07 Pressure and Vacuum Calibration
	200 to 300 psig	0.005 9 psig	Fluke PG7601 Deadweight Tester, 200 kPa/kg SOP-07 Pressure and Vacuum Calibration
	300 to 400 psig	0.007 4 psig	Fluke PG7601 Deadweight Tester, 200 kPa/kg SOP-07 Pressure and Vacuum Calibration
	400 to 600 psig	0.011 psig	Fluke PG7601 Deadweight Tester, 200 kPa/kg SOP-07 Pressure and Vacuum Calibration

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Lake Balance Calibration Solutions
7722 Metric Drive, Mentor, OH, 44060
Contact Name: Mark Hanson Phone: 440-299-4811

Accreditation is granted to the facility to perform the following calibrations:

Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Force - Compression & Tension [FO]	Up to 500 lbf	0.1 lbf	Class F Weights SOP-13 Force Calibration
	500 lbf to 1 000 lbf	0.63 lbf	Load Cells SOP-13 Force Calibration
	1 000 lbf to 2 500 lbf	2.1 lbf	
	2 500 lbf to 5 000 lbf	2.7 lbf	
	5 000 lbf to 7 500 lbf	5.3 lbf	
	7 500 lbf to 10 000 lbf	6.3 lbf	
	10 000 lbf to 25 000 lbf	22 lbf	
	25 000 lbf to 50 000 lbf	31 lbf	
Equipment to measure Force-Compression and Tension [F]	Up to 10 lbf	0.003 lbf	Class F Weights SOP-13 Force Calibration
	10 to 100 lbf	0.017 lbf	
	100 to 200 lbf	0.029 lbf	
	200 to 500 lbf	0.1 lbf	
Laboratory and Precision Balances [FO]	Up to 20 g (0.001 mg)	14 µg	Class 1 Weights SOP-10 Balance and Scale Calibration
	20 g to 40 g (0.01 mg)	30 µg	
	40 g to 60 g (0.01 mg)	39 µg	
	60 g to 80 g (0.01 mg)	45 µg	
	80 g to 100 g (0.01 mg)	71 µg	
	100 g to 200 g (0.01 mg)	77 µg	
	200 g to 500 g (0.1 mg)	0.89 mg	
	500 kg to 1 kg (1 mg)	2.6 mg	
	1 kg to 2 kg (1 mg)	2.8 mg	
	2 kg to 4 kg (1 mg)	4.3 mg	

Certificate of Accreditation: Supplement

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Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Laboratory and Precision Balances [FO]	4 kg to 5 kg Res.= (1 mg)	14 mg	Class 1 Weights SOP-10 Balance and Scale Calibration
	5 kg to 10 kg Res.= (1 mg)	24 mg	
	10 kg to 15 kg Res.= (1 mg)	99 mg	
	15 kg to 20 kg Res.= (0.1 g)	0.11 g	
	4 kg to 5 kg Res.= (1 mg)	14 mg	
Scale [FO]	Up to 20 lb Res.=(0.001 lb)	0.001 1 lb	Class F Weights SOP-10 Balance and Scale Calibration
	20 lb to 50 lb Res.= (0.01 lb)	0.007 4 lb	
	50 lb to 100 lb Res.= (0.01 lb)	0.009 6 lb	
	100 lb to 600 lb Res.= (0.1 lb)	0.077 lb	
	600 lb to 1 000 lb Res.= (0.1 lb)	0.12 lb	
	1 000 lb to 2 000 lb Res.= (0.1 lb)	0.17 lb	
	2 000 lb to 3 000 lb Res.= (0.5 lb)	0.37 lb	
	3 000 lb to 4 000 lb Res.= (0.5 lb)	0.48 lb	
Pipettes [FO]	0.5 µL to 2 µL	0.076 µL	Micro-Balance SOP-33 Pipettes
	2 µL to 10 µL	0.078 µL	
	10 µL to 20 µL	0.08 µL	
	20 µL to 100 µL	0.094 µL	
	100 µL to 200 µL	0.16 µL	
	200 µL to 500 µL	0.4 µL	
	500 µL to 1 000 µL	0.51 µL	
	1 000 µL to 5 100 µL	2.5 µL	

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Mass [FO]	Up to 2 g	0.002 mg	Class 0 Weights with: Micro Balance Semi-Micro Balance Analytical Balance Medium Precision Balance Heavy Precision Balance SOP-42 Mass Calibration
	2 g to 20 g	0.009 mg	
	20 g to 200 g	0.046 mg	
	200 g to 1 000 g	0.17 mg	
	1 000 g to 3 000 g	1.1 mg	
	3 000 g to 5 000 g	3.4 mg	
	5 000 g to 10 000 g	6.5 mg	
	10 kg to 30 kg	0.15 g	
	30 kg to 60 kg	0.74 g	

Chemical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Conductivity Meters [F]	1 µS/cm	0.56 µS/cm	Compared to Standard Solutions SOP-44 Conductivity / OEM Manual
	10 µS/cm	0.59 µS/cm	
	100 µS/cm	2.4 µS/cm	
	1 000 µS/cm	6.9 µS/cm	
	10 000 µS/cm	190 µS/cm	
	100 000 µS/cm	2 400 µS/cm	

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represents the smallest measurement uncertainty attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is typically expressed at a confidence level of 95 % using a coverage factor *k* (usually equal to 2). The actual measurement uncertainty associated with a specific calibration performed by the laboratory will typically be larger than the CMC for the same calibration since capability and performance of the device being calibrated and the conditions related to the calibration may reasonably be expected to deviate from ideal to some degree.

2. The laboratories range of calibration capability for all disciplines for which they are accredited is the interval from the smallest calibrated standard to the largest calibrated standard used in performing the calibration. The low end of this range must be an attainable value for which the laboratory has or has access to the standard referenced. Verification of an indicated value of zero in the absence of a standard is common practice in the procedure for many calibrations but by its definition it does not constitute calibration of zero capacity.

3. The presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location. Example: Outside Micrometer[F] would mean that the laboratory performs this calibration at its fixed location.

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4. The presence of a superscript FO means that the laboratory performs calibration of the indicated parameter both at its fixed location and onsite at customer locations. Example: Outside Micrometer^{FO} would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.

5. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.