CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Palen Kimball, LLC DBA PK Calibration & Validation
1717 University Ave. West
St. Paul, MN 55104

Fulfills the requirements of

ISO/IEC 17025:2017

and national standard

ANSI/NCSL Z540-1-1994 (R2002)

In the field of

CALIBRATION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 31 October 2023
Certificate Number: AC-1814

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. 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).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017 AND ANSI/NCSL Z540-1-1994 (R2002)

Palen Kimball, LLC DBA PK Calibration & Validation

1717 University Ave. West
St. Paul, MN 55104
Dennis J. Brady Phone: 651-647-4501
dbrady@palenkimball.com www.palenkimball.com

CALIBRATION

Valid to: **October 31, 2023** Certificate Number: **AC-1814**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source [1]	Up to 220 mV 220 mV to 1 100 V	2.3 µV/V + 1.6 µV 2 µV/V + 0.2 mV	Fluke 5700A Multiproduct Calibrator
DC Voltage – Measure [1]	Up to 100 mV 100 mV to 1 100 V	9 µV/V + 0.3 µV 10 µV/V + 1 mV	HP 3458A 8.5 Digit Multimeter
DC High Voltage – Measure [1]	(1 to 100) kV	6 mV/V	HP 3458A 8.5 Digit Multimeter, HVI DVR-150 Divider
DC Current – Source [1]	10 µA to 2 A	0.16 mA/A + 0.1 µA	Fluke 5700A Multiproduct Calibrator
	(2 to 11) A	0.66 mA/A	Fluke 5520A Multiproduct Calibrator
DC Current – Measure [1]	(0 to 1) A	0.14 µA/A + 10 µA	HP 3458A 8.5 Digit Multimeter
	(1 to 500) A	3.0 mA/A	Empro HA-500-50 Shunt, HP 3458A 8.5 Digit Multimeter
Resistance – Source [1] (Fixed Artifacts)	10 Ω to 10 MΩ	7 µΩ/Ω	L&N Standard Resistors
Resistance – Measure [1]	Up to 2 MΩ (2 to 11) MΩ (11 to 110) MΩ 110 MΩ to 1.1 GΩ	0.1 mΩ/Ω + 0.24 mΩ 0.2 mΩ/Ω 0.8 mΩ/Ω 8.5 mΩ/Ω	HP 3458A 8.5 Digit Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source [1]	(1 to 32.999) mV		Fluke 5700A Multiproduct Calibrator
	(10 to 45) Hz	0.62 mV/V + 4.7 µV	
	45 Hz to 1 kHz	0.12 mV/V + 4.7 µV	
	(1 to 5) kHz	0.12 mV/V + 4.7 µV	
	(5 to 10) kHz	0.12 mV/V + 4.7 µV	
	(10 to 20) kHz	0.15 mV/V + 4.7 µV	
	(20 to 50) kHz	0.78 mV/V + 4.7 µV	
	(50 to 100) kHz	2.7 mV/V + 9.3 µV	
	(100 to 500) kHz	6.2 mV/V + 39 µV	
	(33 to 329.999) mV		
	(10 to 45) Hz	0.23 mV/V + 6.3 µV	
	45 Hz to 1 kHz	0.11 mV/V + 6.3 µV	
	(1 to 5) kHz	0.11 mV/V + 6.3 µV	
	(5 to 10) kHz	0.11 mV/V + 6.3 µV	
	(10 to 20) kHz	0.12 mV/V + 6.4 µV	
	(20 to 50) kHz	0.27 mV/V + 6.3 µV	
	(50 to 100) kHz	0.62 mV/V + 25 µV	
	(100 to 500) kHz	1.6 mV/V + 54 µV	
	330 mV to 3.299 99 V		
	(10 to 45) Hz	0.23 mV/V + 40 µV	
	45 Hz to 1 kHz	0.12 mV/V + 48 µV	
	(1 to 5) kHz	0.12 mV/V + 47 µV	
	(5 to 10) kHz	0.12 mV/V + 48 µV	
	(10 to 20) kHz	0.15 mV/V + 48 µV	
	(20 to 50) kHz	0.23 mV/V + 39 µV	
	(50 to 100) kHz	0.54 mV/V + 98 µV	
	(100 to 500) kHz	1.9 mV/V + 0.47 mV	
	(3.3 to 32.999 9) V		
	(10 to 45) Hz	0.23 mV/V + 0.51 mV	
	45 Hz to 1 kHz	0.12 mV/V + 0.48 mV	
	(1 to 5) kHz	0.12 mV/V + 0.48 mV	
	(5 to 10) kHz	0.12 mV/V + 0.48 mV	
	(10 to 20) kHz	0.19 mV/V + 0.48 mV	
	(20 to 50) kHz	0.27 mV/V + 0.47 mV	
	(50 to 100) kHz	0.7 mV/V + 1.2 mV	
	(33 to 329.999) V		
	45 Hz to 1 kHz	0.15 mV/V + 1.9 mV	
	(1 to 5) kHz	0.15 mV/V + 4.8 mV	
	(5 to 10) kHz	0.15 mV/V + 4.8 mV	
	(10 to 20) kHz	0.19 mV/V + 4.8 mV	
	(20 to 50) kHz	0.23 mV/V + 4.7 mV	
	(50 to 100) kHz	1.6 mV/V + 39 mV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source [1]	(330 to 1 020) V 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.23 mV/V + 11 mV 0.19 mV + 9.4 mV 0.23 mV/V + 8.8 mV	Fluke 5700A Multiproduct Calibrator
AC Voltage – Measure [1]	(1 to 10) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (10 to 100) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (100 to 700) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	 0.009 5 % of reading + 46 µV 0.009 5 % of reading + 0.23 mV 0.017 % of reading + 0.23 mV 0.036 % of reading + 0.23 mV 0.093 % of reading + 0.23 mV 0.35 % of reading + 1.2 mV 1.2 % of reading + 1 mV 1.8 % of reading + 1 mV 0.024 % of reading + 4 mV 0.024 % of reading + 2 mV 0.024 % of reading + 2 mV 0.041 % of reading + 2 mV 0.14 % of reading + 2 mV 0.46 % of reading + 12 mV 1.7 % of reading + 12 mV 0.048 % of reading + 47 mV 0.048 % of reading + 23 mV 0.071 % of reading + 23 mV 0.14 % of reading + 23 mV 0.35 % of reading + 23 mV	HP 3458A 8.5 Digit Multimeter
AC High Voltage – Measure [1]	(1 to 100) kV 60 Hz	 6.6mV/V	HP 3458A 8.5 Digit Multimeter, HVI DVR-150 Divider
AC Current – Source [1]	9 µA to 220 mA 40 Hz to 1 kHz 10 Hz to 5 kHz 220 mA to 2.2 A 40 Hz to 1 kHz (2.2 to 11) A (45 to 500) Hz	 0.33 mA/A + 0.4 µA 1 mA/A + 8 µA 0.26 mA/A + 8 µA 1.2 mA/A + 4 mA	Fluke 5700A Multiproduct Calibrator, Fluke 5520A Multiproduct Calibrator
AC Current – Measure [1]	(0 to 1) A 45 Hz to 5 kHz	 1 mA/A + 200 µA	HP 3458A 8.5 Digit Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure [1]	(1 to 500) A 60 Hz	0.28 µA/A + 400 µA	Empro HA-500-50 Shunt, HP 3458A 8.5 Digit Multimeter
Capacitance – Source [1] (Simulated or Artifact)	1 kHz 1 nF	32 µF/F	ESI SC 1000 Standard Capacitor, Fluke 5520A Multiproduct Calibrator
Capacitance – Source [1] (Artifacts)	190 pF to 3.3 nF 3.3 nF to 11 µF 11 µF to 11 mF (11 to 33) mF (33 to 110) mF	0.75 mF/F + 0.01 nF 0.38 mF/F + 0.1 nF 0.69 mF/F + 10 µF 1.1 mF/F + 30 µF 1.7 mF/F + 0.1 mF	General Radio 1404A/1403D Standard Capacitors, General Radio 1615P1 Range Extension Capacitor, with General Radio 1615A Capacitance Bridge
Capacitance – Measure [1]	1 kHz 1 pF to 10 µF	12 µF/F	General Radio 1615A Capacitance Bridge
Inductance – Source [1] (Artifacts)	1 kHz 100 µH to 10 H	81 µH/H	General Radio 1482B, 1482E, 1482H, 1482L, 1482P Standard Inductors, with General Radio 1632A Inductance Bridge
Inductance – Measure [1]	10 µH to 10 H	0.18 mH/H	General Radio 1632A Inductance Bridge
AC Power – Source [1]	60 Hz 20 W to 20 kW	2 mW/W	Fluke 5520A Multiproduct Calibrator
Oscilloscopes [1] Amplitude – Square Wave	45 Hz to 1 kHz 2.6 mVp-p to 66 Vp-p	4.1 mV/V + 0.15 mV	Fluke 5520A/SC1100 Multiproduct Calibrator
Amplitude – Leveled Sine Wave (50 kHz reference)	5 mVp-p to 5.5 Vp-p 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	30 mV/V + 0.5 mV 66 mV/V + 0.5 mV 61 mV/V + 0.5 mV	
Flatness (50 kHz reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz	3 mV/V + 0.5 mV 6 mV/V + 0.5 mV 66 mV/V + 0.5 mV 61 mV/V + 0.5 mV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes [1] Time Marker into 50 Ω load Rise Time	 2 ns to 1 µs 2 µs to 50 ms 100 ms to 5 s < 2 ns	 4.4 µs/s 5.1 µs/s + 15 ms 15 µs/s + 1 ms 450 ps	Fluke 5520A/SC1100 Multiproduct Calibrator
Electrical Simulation of Thermocouple Indicators – Source/Measure [1]	Type J (-210 to 1 200) °C Type K (-200 to 1 372) °C Type T (-250 to 400) °C Type E (-200 to 1 000) °C	 0.27 °C 0.45 °C 0.72 °C 0.45 °C	Fluke 5520A Multiproduct Calibrator
Electrical Simulation of RTD Indicators – Source [1]	Pt 385 (100 Ω) (-200 to 630) °C Pt 385 (200 Ω) (-200 to 630) °C Pt 3926 (100 Ω) (-200 to 630) °C Pt 3916 (100 Ω) (-200 to 630) °C	 0.18 °C 0.24 °C 0.18 °C 0.37 °C	Fluke 5520A Multiproduct Calibrator

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers [1,3]	Up to 24 in	11 µin/in	Gage Blocks
Micrometers [1,3]	Up to 24 in	11 µin/in	
Length Standards [2]	Up to 24 in	(12 + 4.1*L*) µin	Mahr ULM 600E Length Measuring Machine

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure/Vacuum Gages [1]	(-5 to 5) psi (-15 to 30) psi Up to 30 inHg Up to 10 inH_2O Up to 100 psi Up to 300 psi Up to 500 psi Up to 7 500 psi Up to 10 000 psi	0.003 psi 0.04 psi 0.04 inHg 0.01 inH_2O 0.054 psi 0.2 psi 0.41 psi 5 psi 8.4 psi	Pressure Calibrators with Pressure Modules
Absolute Pressure Gages [1]	Up to 100 psia	0.07 psi	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Measure [1]	(-200 to 420) °C	0.02 °C	Azonix A1101 Thermometer, Burns Engineering 12001 PRT
Humidity – Measure [1]	Up to 90 %RH	1.4 % RH	Vaisala HM70/HMP77B Digital Indicator/Probe

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source [1]	1 MHz 10 MHz	65 pHz/Hz 65 pHz/Hz	WWVB Phase Chart Recorder, GPS Disciplined Oscillator
Frequency – Measure [1]	1 mHz to 350 MHz	1.8 µHz/Hz	Agilent 53230A Universal Frequency Counter

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 (k=2), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. L = length in inches, R = resolution of unit under test.
3. The Best Measurement Capability presented here does not include the Resolution contributor. The value of $0.6R$ will be added to the Measurement Uncertainty at the time of calibration.
4. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1814.

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