



CERTIFICATE OF ACCREDITATION

ANSI National Accreditation Board
11617 Coldwater Road, Fort Wayne, IN 46845 USA

This is to certify that

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

has been assessed by ANAB and meets the requirements of international standard

ISO/IEC 17025:2017

and national standard

ANSI/NCSL Z540-1-1994 (R2002)

while demonstrating technical competence in the field of

CALIBRATION

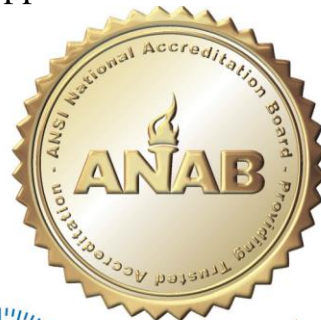
Refer to the accompanying Scope of Accreditation for information regarding the types of activities to which this accreditation applies

AC-1814

Certificate Number


ANAB Approval

Certificate Valid Through: 10/31/2021
Version No. 005 Issued: 10/01/2019



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. 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).



ANSI National Accreditation Board

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, 2021**

Certificate Number: **AC-1814**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage ¹ - Source	Up to 220 mV 220 mV to 1.1 kV	2.3 μ V/V + 1.6 μ V 2 μ V/V + 0.2 mV	Fluke 5700A Multifunction Calibrator
DC Voltage ¹ - Measure	Up to 100 mV 100 mV to 1.1 kV	9 μ V/V + .3 μ V 10 μ V/V + 1 mV	HP 3458A Precision Multimeter
	(1 to 100) kV	6 mV/V	HP 3458A Precision Multimeter HVI DVR-150 Divider
DC Current ¹ - Measure	(0 to 1) A	0.14 μ A/A + 10 μ A	HP 3458A Precision Multimeter
	(1 to 500) A	3.0 mA/A	Empro HA-500-50 Shunt HP 3458A Precision Multimeter
DC Current ¹ - Source	10 μ A to 2 A	0.16 mA/A + 0.1 μ A	Fluke 5700A Multifunction Calibrator
	(2 to 11) A	0.66 mA/A	Fluke 5520A Multifunction Calibrator
Resistance ¹ - Source	10 Ω to 10 M Ω	7 μ Ω / Ω	L&N Standard Resistors
Resistance ¹ - Measure	Up to 2 M Ω (2 to 11) M Ω (11 to 110) M Ω 110 M Ω to 1.1 G Ω	0.1 m Ω / Ω + 0.24 m Ω 0.2 m Ω / Ω 0.8 m Ω / Ω 8.5 m Ω / Ω	HP 3458A Precision Multimeter



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AC Voltage ¹ - Source	(1 to 32.999) mV		
	(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	
330 V to 1.02 kV			
45 Hz to 1 kHz		0.23 mV/V + 11 mV	
(1 to 5) kHz		0.19 mV/V + 9.4 mV	
(5 to 10) kHz		0.23 mV/V + 8.8 mV	
			Fluke 5700A Multifunction Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage ¹ – Measure	(1 to 10) V		HP 3458A Precision Multimeter
	(1 to 40) Hz	0.009 5 % of reading + 46 μ V	
	40 Hz to 1 kHz	0.009 5 % of reading + 231 μ V	
	(1 to 20) kHz	0.017 % of reading + 231 μ V	
	(20 to 50) kHz	0.036 % of reading + 231 μ V	
	(50 to 100) kHz	0.093 % of reading + 231 μ V	
	(100 to 300) kHz	0.35 % of reading + 1.2 mV	
	300 kHz to 1 MHz	1.2 % of reading + 1 mV	
	(1 to 2) MHz	1.8 % of reading + 1 mV	
	(10 to 100) V		
	(1 to 40) Hz	0.024 % of reading + 4 mV	
	40 Hz to 1 kHz	0.024 % of reading + 2 mV	
(1 to 20) kHz	0.024 % of reading + 2 mV		
(20 to 50) kHz	0.041 % of reading + 2 mV		
(50 to 100) kHz	0.14 % of reading + 2 mV		
(100 to 300) kHz	0.46 % of reading + 12 mV		
300 kHz to 1 MHz	1.7 % of reading + 12 mV		
(100 to 700) V			
(1 to 40) Hz	0.048 % of reading + 47 mV		
40 Hz to 1 kHz	0.048 % of reading + 23 mV		
(1 to 20) kHz	0.071 % of reading + 23 mV		
(20 to 50) kHz	0.14 % of reading + 23 mV		
(50 to 100) kHz	0.35 % of reading + 23 mV		
AC Voltage ¹ – Measure	(1 to 100) kV 60 Hz	6.6mV/V	HP 3458A Precision Multimeter HVI DVR-150 Divider
AC Current ¹ - Source	9 μ A to 220 mA		Fluke 5700A, Fluke 5520A Multifunction Calibrator
	40 Hz to 1 kHz	0.33 mA/A + 0.4 μ A	
	10 Hz to 5 kHz	1 mA/A + 8 μ A	
	220 mA to 2.2 A		
40 Hz to 1 kHz	0.26 mA/A + 8 μ A		
(2.2 to 11) A			
(45 to 500) Hz	1.2 mA/A + 4 mA		
AC Current ¹ – Measure	(0 to 1) A		HP 3458A Precision Multimeter
	45 Hz to 5 kHz	1 mA/A + 200 μ A	
	(1 to 500) A		Empro HA-500-50 Shunt HP 3458A Precision Multimeter
	60 Hz	0.28 μ A/A + 400 μ A	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance ¹ - Source	1 nF at 1 kHz	32 μ F/F	ESI SC 1000 Standard Capacitor, Fluke 5520A Multifunction Calibrator
	190 pF to 3.3 nF 3.3 nF to 11 μ F 11 μ F 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 μ F 1.1 mF/F + 30 μ F 1.7 mF/F + 0.1 mF	GR1404A, GR1403D, GR1615P1, GR1615A Standard Capacitors
Capacitance ¹ - Measure at 1 kHz	1 pF to 10 μ F	0.012 mF/F	GenRad 1615A Capacitance Bridge
Inductance ¹ Source at 1kHz	100 μ H to 10 H	0.081 mH/H	GenRad 1482B, 1482E, 1482H, 1482L, 1482P Standard Inductors, 1632A Inductance Bridge
Inductance ¹ - Measure	10 μ H to 10 H	0.18 mH/H	GenRad 1632A Inductance Bridge
Power ¹ - Source at 60 Hz	20 W to 20 kW	2 mW/W	Fluke 5520A Multifunction Calibrator
Oscilloscopes ¹ Amplitude Square wave 45 Hz to 1 kHz	2.6 mV to 66 V	4.1 mV/V + 0.15 mV	Fluke 5520A/SC1100 Multifunction Calibrator
Leveled Sine Wave Amplitude (50 kHz reference)	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	
Time Marker into 50 Ω Load - Source	5 s to 100 ms 50 ms to 2 μ s 1 μ s to 2 ns	15 μ s/s + 1 mHz 5.1 μ s/s + 15 mHz 4.4 μ s/s	
Rise Time	< 2 ns	450 ps	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation & Measure of Thermocouple Indicators ¹	Type J (-210 to 1 200) °C	0.27 °C	Fluke 5520A Multifunction Calibrator
	Type K (-200 to 1 372) °C	0.45 °C	
	Type T (-250 to 400) °C	0.72 °C	
	Type E (-200 to 1 000) °C	0.45 °C	
Electrical Simulation of RTD Indicators ¹	Pt 385 (100 Ω) (-200 to 630) °C	0.18 °C	Fluke 5520A Multifunction Calibrator
	Pt 385 (200 Ω) (-200 to 630) °C	0.24 °C	
	Pt 3926 (100 Ω) (-200 to 630) °C	0.18 °C	
	Pt 3916 (100 Ω) (-200 to 630) °C	0.37 °C	

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,2}	Up to 24 in	(0.6R + 11L) μin	Gage Blocks
Micrometers ^{1,2}	Up to 24 in	(0.6R + 11L) μin	
Length ²	Up to 24 in	(0.3 + L/1 500) μm	Mahr ULM 600E Length Measuring Machine

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure and Vacuum Gages ¹	Up to 10 in H2O Up to 100 psia Up to 300 psi Up to 7 500 psi Up to 30 in Hg	0.01 in H2O 0.07 psi 0.2 psi 5 psi 0.04 in Hg	Pressure Calibrator and Modules, Fluke, Heise, Ametek, Druck Model PM620



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure and Vacuum Gages ¹	(-15 to 30) psi	0.04 psi	Pressure Calibrator and Modules, Fluke, Heise, Ametek, Druck Model PM620
	Up to 500 psi	0.25 psi	
	(-5 to 5) psi	0.003 psi	
	Up to 100 psi	0.054 psi	
	Up to 500 psi	0.41 psi	
	Up to 10 000 psi	8.4 psi	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature ¹ - Measure	(-20 to 100) °C	0.06 °C	Hart 1504 Indicator with Hart 5610 Thermistor
	(-200 to 420) °C	0.02 °C	Azonix A1101 Thermometer, Burns Engineering 12001 PRT
Humidity ¹	(0 to 90) %RH	1.4 %RH	Vaisala HM70 Hygrometer, HMP77B Probe

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency ¹	1MHz 10 MHz	0.000 065 μHz/Hz 0.000 065 μHz/Hz	WWVB Phase Chart Recorder, GPS Disciplined Oscillator
	1mHz to 350 MHz	1.8 μHz/Hz	Agilent 53230A 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. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1814.

Vice President