CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board
500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

Cal Tec Process Management, LLC
1400 Grange Hall Road, Suite 500
Beavercreek, OH 45430

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

ISO/IEC 17025:2005

while demonstrating technical competence in the field of

CALIBRATION

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

AC-1320
Certificate Number

ANAB Approval

Certificate Valid: 03/05/2018 - 04/10/2020
Version No. 007 Issued: 03/05/2018

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-ASQ National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Cal Tec Process Management, LLC

1400 Grange Hall Road, Suite 500
Beavercreek, OH 45430
George Urban

CALIBRATION

Valid to: **April 10, 2020** Certificate Number: **AC-1320**

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
GPS Receivers Survey Grade	Global Positioning	HD 0.012 ft VD 0.02 ft	Certified Length Master
Total Station[2] Theodolite	H/V Distance (Angle) Base Line (Linear Distance)	0.0024 in 0.008 ft	CTPM Linear Master CTPM Optical Range
Auto/Builders Level[2]	Level Accuracy	0.004 6 in	CTPM Linear Master
Rotating Laser[2,3]	Level Accuracy	0.004 6 in	CTPM Linear Master
Height Gages[3]	Up to 24 in	(85 + 12*L*) µin	Length Standard, Gage Blocks
Outside Micrometers[3]	Up to 48 in	(19 + 15*L*) µin	Gage Blocks, Length Standards
Inside Micrometers[3]	(0.5 to 40) in	(48 + 13*L*) µin	Length Machine, Length Standard
Depth Micrometers[3]	Up to 12 in	(95 + 9*L*) µin	Depth Master, Gage Blocks
Dial Indicators	Up to 2 in	67 µin	Indicator Calibrator, Gage Blocks
Calipers[3]	Up to 24 in	(86 + 12*L*) µin	Cal Master, Gage Blocks, Length Standards

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plugs[2,3] Pitch & Major Diameter	(0.01 to 8) in	(17 + 7*L*) µin	Bench Micrometer, Laser Attachment, Thread Wires
Pin Gages[3]	(0.012 to 2) in	(15 + 14*L*) µin	Laser Micrometer
Plain Plug Gages[2,3]	(0.012 to 8) in	(3 + 8*L*) µin	Bench Micrometer, Laser Attachment
Gage Blocks[2,3]	(0.005 to 4) in	(9.3 + 1.3*L*) µin	DMS 680 Master Gage Blocks
Laser Micrometers[3]	(0.005 to 12) in	(15 + 10*L*) µin	Master Gage Pins
Surface Plate Overall Flatness[3]	(1 to 2.5) sf (1 to 32) sf	(21 + 0.8*X*) µin (94 + 2.1*X*) µin	Mahr Federal Level System
Linear Measurement	(0.01 to 40) in	7.1 µin	Linear Laser System
	(0.01 to 20) in	(100 + 7.6*L*) µin	CMM

Electrical - DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage - Source	Up to 320 mV 320 mV to 3.2 V (3.2 to 32) V (32 to 320) V 320 V to 1 kV	71 µV/V + 8.5 µV 65 µV/V + 65 µV 75 µV/V + 0.73 mV 77 µV/V + 11 mV 73 µV/V + 23 mV	Multifunction Calibrator
DC Voltage - Measure	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	71 µV/V + 5.9 µV 65 µV/V + 42 µV 70 µV/V + 0.42 mV 75 µV/V + 4.5 mV 77 µV/V + 23 mV	Precision DMM

Electrical - DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Measure	1 mV to 1 V		Precision DMM
	(3 to 5) Hz	10 mV/V + 0.49 mV	
	(5 to 10) Hz	3.5 mV/V + 0.49 mV	
	10 Hz to 20 kHz	0.85 V/V + 1 mV	
	(20 to 50) kHz	1.5 mV/V + 2 mV	
	(50 to 100) kHz	6.4 mV/V + 5.2 mV	
AC Voltage - Measure	(1 to 100) V		Precision DMM
	(3 to 5) Hz	10 mV/V + 31 mV	
	(5 to 10) Hz	3.5 mV/V + 31 mV	
	10 Hz to 20 kHz	1 mV/V + 34 mV	
	(20 to 50) kHz	1.9 mV/V + 59 mV	
	(50 to 100) kHz	7 mV/V + 0.13 V	
	100 V to 1 kV		
	(3 to 5) Hz	10 mV/V + 0.26 V	
	(5 to 10) Hz	3.6 mV/V + 0.26 V	
	10 Hz to 20 kHz	1.4 mV/V + 0.39 V	
	(20 to 50) kHz	1.9 mV/V + 0.49 V	
	(50 to 100) kHz	7 mV/V + 0.68 V	
AC Voltage - Source	Up to 10 mV		Multifunction Calibrator
	10 Hz to 3 kHz	0.72 mV/V + 0.39 mV	
	(3 to 10) kHz	0.72 mV/V + 0.52 mV	
	(10 to 30) kHz	1.4 mV/V + 0.97 mV	
	(30 to 50) kHz	1.5 mV/V + 2 mV	
	(50 to 100) kHz	6.4 mV/V + 5.1 mV	
	(10 to 32) mV		
	10 Hz to 3 kHz	0.72 mV/V + 0.11 mV	
	(3 to 10) kHz	2.3 mV/V + 0.13 mV	
	(10 to 30) kHz	1.4 mV/V + 0.25 mV	
	(30 to 50) kHz	1.5 mV/V + 0.49 mV	
	(50 to 100) kHz	2 mV/V + 1.3 mV	
	(32 to 320) mV		
	10 Hz to 3 kHz	0.72 mV/V + 0.3 mV	
	(3 to 10) kHz	0.72 mV/V + 0.3 mV	
	(10 to 30) kHz	1.4 mV/V + 0.5 mV	
	(30 to 50) kHz	1.5 mV/V + 0.51 mV	
	(50 to 100) kHz	6.3 mV/V + 0.84 mV	

Electrical - DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Source	320 mV to 3.2 V		Multifunction Calibrator
	10 Hz to 3 kHz	0.72 mV/V + 3 mV	
	(3 to 10) kHz	0.72 mV/V + 3 mV	
	(10 to 30) kHz	1.4 mV/V + 5 mV	
	(30 to 50) kHz	1.5 mV/V + 5.1 mV	
	(50 to 100) kHz	6.3 mV/V + 8.4 mV	
	(3.2 to 32) V		
	10 Hz to 3 kHz	0.72 mV/V + 30 mV	
	(3 to 10) kHz	0.85 mV/V + 30 mV	
	(10 to 30) kHz	1.5 mV/V + 50 mV	
	(30 to 50) kHz	1.9 mV/V + 51 mV	
	(50 to 100) kHz	7 mV/V + 86 mV	
	(32 to 105) V		
	10 Hz to 3 kHz	0.72 mV/V + 0.23 V	
	(3 to 10) kHz	0.85 mV/V + 0.23 V	
	(10 to 30) kHz	1.5 mV/V + 0.38 V	
	(30 to 50) kHz	1.9 mV/V + 0.38 V	
	(50 to 100) kHz	7 mV/V + 0.61 V	
	(105 to 320) V		
	40 Hz to 1 kHz	0.79 mV/V + 0.23 V	
	(1 to 3) kHz	1 mV/V + 0.23 V	
	(3 to 10) kHz	1 mV/V + 0.23 V	
	(10 to 20) kHz	1.4 mV/V + 0.23 V	
	(20 to 30) kHz	1.9 mV/V + 0.38 V	
	(320 to 800) V		
	40 Hz to 1 kHz	0.79 mV/V + 0.24 V	
	(1 to 3) kHz	1 mV/V + 0.24 V	
	(3 to 10) kHz	1 mV/V + 0.25 V	
	(10 to 20) kHz	1.4 mV/V + 0.28 V	
	(20 to 30) kHz	1.9 mV/V + 0.43 V	
	800 V to 1 kV		
	40 Hz to 1 kHz	0.79 mV/V + 0.26 V	
	(1 to 3) kHz	1 mV/V + 0.26 V	
	(3 to 10) kHz	1 mV/V + 0.31 V	
	(10 to 20) kHz	1.4 mV/V + 0.39 V	

Electrical - DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance - Measure	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	1 mΩ/Ω + 0.24 Ω 1 mΩ/Ω + 0.25 Ω 0.37 mΩ/Ω + 0.31 Ω 0.37 mΩ/Ω + 0.84 Ω 0.27 mΩ/Ω + 20 Ω 0.42 mΩ/Ω + 0.20 kΩ 0.64 mΩ/Ω + 2 kΩ 8 mΩ/Ω + 41 kΩ 20 mΩ/Ω + 0.11 MΩ	Precision DMM
Resistance - Source	Up to 40 Ω 40 Ω to 4 kΩ (4 to 40) kΩ (40 to 400) kΩ 400 kΩ to 4 MΩ (4 to 40) MΩ (40 to 400) MΩ	1 mΩ/Ω + 0.24 Ω 0.37 mΩ/Ω + 0.32 Ω 0.27 mΩ/Ω + 2.3 Ω 0.27 mΩ/Ω + 23 Ω 0.57 mΩ/Ω + 0.23 kΩ 8 mΩ/Ω + 10 kΩ 20 mΩ/Ω + 0.11 MΩ	Multifunction Calibrator
DC Current - Source	Up to 320 µA 320 µA to 3.2 mA (3.2 to 32) mA (32 to 320) mA 320 mA to 3.2 A (3.2 to 10.5) A	0.52 mA/A + 2.3 µA 0.52 mA/A + 3.1 µA 0.52 A/A + 5.6 µA 0.53 A/A + 0.2 mA 1.6 mA/A + 0.81 mA 1.6 mA/A + 1.3 mA	Multifunction Calibrator
	(10.5 to 750) A	0.21 mA/A	Multifunction Calibrator Wavetek 50 Turn Coil
DC Current - Measure	(1 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 10) A	0.52 mA/A + 49 nA 0.52 mA/A + 0.11 µA 0.52 A/A + 2.2 µA 0.53 mA/A + 11 µA 0.79 mA/A + 0.23 mA 1.6 mA/A + 1.3 mA	Precision DMM

Electrical - DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current - Measure	Up to 100 µA 10 Hz to 5 kHz 100 µA to 1 mA 10 Hz to 5 kHz (1 to 10) mA 10 Hz to 5 kHz (10 to 100) mA 10 Hz to 5 kHz 100 mA to 1 A 10Hz to 1 kHz (1 to 10) A 10 Hz to 5 kHz	 1.8 mA/A + 1.8 µA 1.4 mA/A + 0.72 µA 1.8 mA/A + 8.8 µA 1.4 mA/A + 63 µA 2.7 mA/A + 2.6 mA 5.3 mA/A + 12 mA	Precision DMM
AC Current - Source	Up to 32 µA 10 Hz to 3 kHz 3 kHz to 10 kHz (32 to 320) µA 10 Hz to 3 kHz 3 kHz to 10 kHz	 1.7 mA/A + 2.5 µA 3.7 mA/A + 3 µA 1.7 mA/A + 2.4 µA 3.7 mA/A + 3.5 µA	Multifunction Calibrator
AC Current - Source	320 µA to 3.2 mA 10 Hz to 3 kHz 3 kHz to 10 kHz (3.2 to 320) mA 10 Hz to 3 kHz 3 kHz to 10 kHz 320 mA to 3.2 A 10 Hz to 3 kHz 3 kHz to 10 kHz (3.2 to 10.5) A 10 Hz to 3 kHz 3 kHz to 10 kHz	 1.7 mA/A + 6.5 µA 3.7 mA/A +71 µA 1.7 mA/A+ 0.40 mA 3.7 mA/A + 70 mA 1.8 mA/A + 6 mA 4.3 mA/A + 70 mA 2.5 mA/A + 6.7 mA 6.1 mA/A + 71 mA	Multifunction Calibrator
	(10.5 to 750) A 10 Hz to 3 kHz	 21 mA/A + 2.01 A	Multifunction Calibrator with 50-Turn Coil
Oscilloscopes - Bandwidth Referenced to 50 kHz	50 kHz to 600 MHz	4.8 MHz	Multifunction Calibrator
Oscilloscopes - Rise Time	5 nS to 100 mS 100 mS to 5 S	3.1 mS 80 mS	Multifunction Calibrator

Electrical - DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Measurement and Simulation of Thermocouple Indicators			Multifunction Calibrator
Type E	(-250 to 1 000) °C	1.3 °C	
Type J	(-210 to 1 200 °C	1.3 °C	
Type K	(-250 to 1 370) °C	1.3 °C	
Type N	(-270 to 1 130) °C	1.3 °C	
Type S	(0 to 1 700) °C	1.3 °C	
Type T	(-250 to 1 000) °C	1.3 °C	

Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure	(-12 to 100) psi	0.02 psi	Crystal Engineering Master Gage
	(0 to 1 000) psi	0.42 psi	Druck DPI104 Master Gage
	(1 000 to 3 000) psi	5 psi	
Pressure[2]	(1 000 to 10 000) psi	5 psi	
Torque Tools[3]	(1 to 10) lbf·in	(0.71 + 0.003*T*) lbf·in	Torque Calibrator
	(10 to 100) lbf·in	(0.68 + 0.002*T*) lbf·in	
	(100 to 1 000) lbf·in	(0.68 + 0.002*T*) lbf·in	
	(60 to 600) lbf·ft	(0.31 + 0.006*T*) lbf·ft	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Measure	(0 to 60) °C	0.18 °C	Fluke 1620A w/ probe
Humidity Measure	(20 to 70) %RH	1.6 %RH	Fluke 1620A w/ probe
Temperature Source (Thermometers Thermocouples)	(-25 to 350) °C	0.8 °C	Fluke 9142 Field Metrology Well Platinum Thermometer

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Ovens/Furnaces	(0 to 850) °C	1.2 °C	Data Acquisition Thermocouple Wire
Temperature Controllers Temperature Recorders	(0 to 850) °C	1.2 °C	Temperature Calibrator Thermocouple Wire

Time & Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency - Source	10 Hz to 600 MHz 100 MHz to 3.2 GHz	1.4 µHz/Hz 1.2 µHz/Hz	Multifunction Calibrator Frequency Generator
Frequency - Measure	10 Hz to 8 GHz	0.63 µHz/Hz	Comparison to 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. Parameters calibrated in the laboratory only and are not available for on-site calibration.
3. The terms (*L*) represents Length in inches, (*X*) represents area in Square Feet, and (T) represents applied Torque.
4. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1320.