



# PERRY JOHNSON LABORATORY ACCREDITATION, INC.

## Certificate of Accreditation

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

### **CTC, Inc.**

**12637 Hoover Street, Garden Grove, CA, 92841**

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

### **ISO/IEC 17025:2017 & Meets the Requirements of ANSI/NCSL Z540.3-2006**

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, Mechanical, Electrical, Mass, Force, Weighing,  
Thermodynamic, and Time & Frequency 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

*Initial Accreditation Date:*

December 29, 2016

*Issue Date:*

November 15, 2020

*Expiration Date:*

February 28, 2023

*Accreditation No.:*

91218

*Certificate No.:*

L20-695

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

*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.pjilabs.com](http://www.pjilabs.com)*



# Certificate of Accreditation: Supplement

## CTC, Inc.

12637 Hoover Street, Garden Grove, CA, 92841  
 Contact Name: Nonna Thomsen Phone: 562-989-2366

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

### Chemical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
pH Meters, Fixed points <sup>FO</sup>	4 pH	0.014 pH	pH Buffers GIDEP NAVAIR 17-20SC-42
	7 pH		
	10 pH		
Conductivity Meters <sup>FO</sup>	10 $\mu$ S/cm at 25 °C	0.68 $\mu$ S/cm	Conductivity Solutions Manufacturer Specifications
	100 $\mu$ S/cm at 25 °C	2.6 $\mu$ S/cm	
	1 000 $\mu$ S/cm at 25 °C	6.4 $\mu$ S/cm	
	1 413 $\mu$ S/cm at 25 °C	5.9 $\mu$ S/cm	
	10 000 $\mu$ S/cm at 25 °C	13 $\mu$ S/cm	

### Dimensional

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Micrometers <sup>FO</sup>	Up to 36 in	(74.5 + 6.5L) $\mu$ in	Gage Blocks T.O. 33K6-4-15-1
Calipers <sup>FO</sup>	Up to 11.9 in	(157 + 3.7L) $\mu$ in	Gage Blocks. T.O. 33K6-4-552-1
	12 in to 36 in	(265 + 7.9L) $\mu$ in	
Height Gages <sup>FO</sup>	Up to 40 in	(69.5 + 3.4L) $\mu$ in	Gage Blocks T.O. 33K6-4-1626-1
Steel Ruler <sup>FO</sup>	0.05 in to 36 in	0.036 in	Gage Blocks. CP-18
Tape Measure <sup>F</sup>	Up to 360 in	0.073 in	
Indicators <sup>FO</sup>	0.05 in to 1in	(61.95 + 5.4L) $\mu$ in	Gage Blocks T.O. 33K6-4-889-1
Optical Comparator Angularity <sup>FO</sup>	0° to 90°	0.021°	Gage Blocks NAVAIR 17-20MD-63
Optical Comparator X and Y Axis Travel <sup>FO</sup>	Up to 20 in	510 $\mu$ in	Gage Blocks NAVAIR 17-20MD-63
Optical Comparator X and Y Axis Squareness <sup>FO</sup>	Up to 20 in	510 $\mu$ in	
Optical Comparator Magnification <sup>FO</sup>	10X	0.002 in	Gage Blocks, Glass Scale NAVAIR 17-20MD-63
	20X	0.001 in	
	50X	430 $\mu$ in	
	100X	250 $\mu$ in	
Pin Gages <sup>F</sup>	0.05 in to 1 in	43 $\mu$ in	Pratt and Whitney LMU T.O. 33K6-4-121-1
Gage Blocks and Ring Gages <sup>F</sup>	0.05 in to 12 in	(5.2 + 0.74L) $\mu$ in	Pratt and Whitney LMU T.O. 33K6-4-1-1
Bore Gages 2 Point <sup>F</sup>	Up to 4 in	93 $\mu$ in	Gage Blocks, Ring Gages T.O. 33K6-4-992-1



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### Dimensional

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End Measuring Rods <sup>F</sup>	1 in to 24 in	(43 + 0.52L) $\mu$ m	Standard Measuring Machine NAVAIR 17-20MD-76

### Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure DC Voltage <sup>F</sup>	31 $\mu$ V to 329.999 mV	0.1 $\mu$ V/mV + 4.5 $\mu$ V	Fluke 5500A NAVAIR 17-20AO-348 OEM MANUAL
	0.33 V to 3.299 V	59 $\mu$ V/V + 6.7 $\mu$ V	
	3.3 V to 32.999 V	59 $\mu$ V/V + 67 $\mu$ V	
	30 V to 329.999 V	660 $\mu$ V/V + 65 $\mu$ V	
	100 V to 1 000 V	65 $\mu$ V/V + 1 778 $\mu$ V	
Equipment to Output DC Voltage <sup>F</sup>	47 $\mu$ V to 200 mV	0.01 $\mu$ V/V + 47 $\mu$ V	
	200 mV to 2 V	46 $\mu$ V/V + 39 $\mu$ V	
	2 V to 20 V	42 $\mu$ V/V + 47 $\mu$ V	
	20 V to 200 V	23 $\mu$ V/V + 745 $\mu$ V	
	200 V to 1 000 V	1.7 $\mu$ V/V + 4 974 $\mu$ V	
Equipment to Measure DC Current <sup>F</sup>	13 $\mu$ A to 3.299 mA	0.61 $\mu$ A/mA + 11 $\mu$ A	
	3.3 mA to 32.999 mA	0.47 $\mu$ A/mA + 9.5 $\mu$ A	
	33 mA to 329.999 mA	0.08 $\mu$ A/mA + 26 $\mu$ A	
	0.33 A to 2.199 A	182 $\mu$ A/A + 50 $\mu$ A	
	2.2 A to 11 A	694 $\mu$ A/A + 475 $\mu$ A	
Equipment to Output DC Current <sup>F</sup>	0.5 $\mu$ A to 200 $\mu$ A	0.049 $\mu$ A	
	200 $\mu$ A to 2 mA	6.2 $\mu$ A/mA + 0.7 $\mu$ A	
	2 mA to 20 mA	0.67 $\mu$ A/mA + 12 $\mu$ A	
	20 mA to 200 mA	0.47 $\mu$ A/mA + 16 $\mu$ A	
	200 mA to 2 A	28 $\mu$ A/mA + 1 045 $\mu$ A	



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Temperature Calibration, Indication and Control Equipment used with Thermocouple Type B <sup>F</sup>	600 °C to 800 °C	0.55 °C	Electrical Simulation of Thermocouple Output Fluke 7526A OEM MANUAL
	800 °C to 1 550 °C	0.36 °C	
	1 550 °C to 1 820 °C	0.31 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type C <sup>F</sup>	0 °C to 1 000 °C	0.22 °C	
	1 000 °C to 1 800 °C	0.31 °C	
	1 800 °C to 2 000 °C	0.34 °C	
	2 000 °C to 2 316 °C	0.45 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type E <sup>F</sup>	-200 °C to -100 °C	0.36 °C	
	-100 °C to 0 °C	0.24 °C	
	0 °C to 600 °C	0.12 °C	
	600 °C to 1 000 °C	0.13 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J <sup>F</sup>	-210 °C to -100 °C	0.25 °C	
	-100 °C to 800 °C	0.13 °C	
	800 °C to 1 200 °C	0.15 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K <sup>F</sup>	-250 °C to -200 °C	0.57 °C	
	-200 °C to -100 °C	0.29 °C	
	-100 °C to 500 °C	0.15 °C	
	500 °C to 800 °C	0.15 °C	
	800 °C to 1 372 °C	0.18 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type N <sup>F</sup>	-250 °C to -200 °C	0.87 °C	
	-200 °C to -100 °C	0.34 °C	
	-100 °C to 0 °C	0.25 °C	
	0 °C to 100 °C	0.25 °C	
	100 °C to 800 °C	0.16 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type R <sup>F</sup>	800 °C to 1 300 °C	0.18 °C	
	0 °C to 100 °C	0.63 °C	
	100 °C to 400 °C	0.38 °C	
	400 °C to 1 000 °C	0.33 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type S <sup>F</sup>	1 000 °C to 1 767 °C	0.32 °C	
	0 °C to 400 °C	0.70 °C	
	400 °C to 1 000 °C	0.39 °C	
	1 000 °C to 1 600 °C	0.32 °C	
	1 600 °C to 1 767 °C	0.59 °C	



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Temperature Calibration, Indication and Control Equipment used with Thermocouple Type T <sup>F</sup>	-250 °C to -200 °C	0.44 °C	Electrical Simulation of Thermocouple Output Fluke 7526A OEM MANUAL
	-200 °C to -100 °C	0.25 °C	
	-100 °C to 0 °C	0.21 °C	
	0 °C to 200 °C	0.29 °C	
	200 °C to 400 °C	0.29 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Indicators/Detectors Type Pt 385, 100 $\Omega^F$	-200 °C to -80 °C	0.061 °C	Electrical Simulation of RTD Output Fluke 7526A OEM MANUAL
	-80 °C to 100 °C	0.031 °C	
	100 °C to 300 °C	0.035 °C	
	300 °C to 400 °C	0.037 °C	
	400 °C to 630 °C	0.047 °C	
	630 °C to 800 °C	0.052 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Indicators/Detectors Type Pt 385, 200 $\Omega^F$	-200 °C to -80 °C	0.064 °C	
	-80 °C to 0 °C	0.067 °C	
	0 °C to 100 °C	0.071 °C	
	100 °C to 260 °C	0.071 °C	
	260 °C to 300 °C	0.083 °C	
	300 °C to 400 °C	0.085 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Indicators/Detectors Type Pt 385, 500 $\Omega^F$	-200 °C to 0°C	0.04 °C	
	0 °C to 100 °C	0.043 °C	
	100 °C to 300 °C	0.048 °C	
	300 °C to 400 °C	0.047 °C	
	400 °C to 630 °C	0.055 °C	
Temperature Calibration, Indication, and Control Equipment used with RTD Indicators/Detectors Type Pt 385, 1 k $\Omega^F$	-200 °C to 0°C	0.031 °C	
	0 °C to 100 °C	0.033 °C	
	100 °C to 300 °C	0.033 °C	
	300 °C to 400 °C	0.035 °C	
	400 °C to 630 °C	0.041 °C	



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Temperature Calibration, Indication, and Control Equipment used with RTD Indicators/Detectors Type Pt 3916, 100 $\Omega^F$	-200 °C to -190 °C	0.02 °C	Electrical Simulation of RTD Output Fluke 7526A OEM MANUAL	
	-190°C to -80 °C	0.023 °C		
	-80 °C to 0 °C	0.024 °C		
	0 °C to 100 °C	0.026 °C		
	100 °C to 300 °C	0.032 °C		
	300 °C to 400 °C	0.036 °C		
	400 °C to 600 °C	0.041 °C		
Temperature Calibration, Indication, and Control Equipment used with RTD Indicators/Detectors Type Pt 3926, 100 $\Omega^F$	-200 °C to -80 °C	0.021 °C		
	-80 °C to 0 °C	0.023 °C		
	0 °C to 100 °C	0.025 °C		
	100 °C to 300 °C	0.031 °C		
	300 °C to 400 °C	0.035 °C		
Equipment to Measure Eddy Current Conductivity <sup>F</sup>	16 % IACS to 25 % IACS	0.38 % IACS		Sigmascopes SMP10 & EC Conductivity Reference Blocks BAC 5651
	25.1 % IACS to 63 % IACS	0.5 % IACS		
	63.1 % IACS to 101 % IACS	1.4 % IACS		
Eddy Current Conductivity Standard Blocks <sup>F</sup>	16 % IACS to 25 % IACS	0.38 % IACS		
	25.1 % IACS to 63 % IACS	0.5 % IACS		
	63.1 % IACS to 101 % IACS	1.4 % IACS		

### 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 ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Force, Tension, and Compression <sup>FO</sup>	0 lbf to 15 000 lbf	0.5 % of reading	Calibrated Load Cell T.O. 33K6-4-433-1
Balances <sup>FO</sup>	Up to 5 g	0.038 mg	Class 1 Weights T.O. 33K6-4-677-1
	5 g to 205 g	0.34 mg	
	200 g to 500 g	3.3 mg	
	500 g to 4 000 g	33 mg	
	4 kg to 10 kg	330 mg	
Platform Scales <sup>FO</sup>	1 lb to 1 500 lb	0.52 lb	Class F Weights T.O. 33K6-4-3356-1



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### Mechanical

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Pressure Gages <sup>FO</sup>	.1 psi g to 30 psi g	.24 psi g	DWT/PSI Gage Comparator Test Gages T.O. 33K6-4-427
	31 psi g to 1 000 psi g	1.7 psi g	
	1 001 psi to 5 000 psi g	1.8 psi g	
	5 001 psi g to 10 000 psi g	2.7 psi g	
Vacuum Gauges <sup>FO</sup>	-0.1 in Hg to -30 in Hg	0.02 in Hg	Reference Grade Digital T.O. 33K6-4-427
Torque <sup>F</sup>	4 lbf•in to 50 lbf•in	0.21 lbf•in	AKO Torque Calibration System NAVAIR 17-20MU-81
	51 lbf•in to 1 000 lbf•in	2.7 lbf•in	
	1 001 lbf•in to 2 400 lbf•in	3.5 lbf•in	
	30 lbf•ft to 250 lbf•ft	1.3 lbf•ft	
	100 lbf•ft to 1 000 lbf•ft	8.9 lbf•ft	
Indirect Verification Rockwell Hardness <sup>FO</sup>	20 HRA to 65 HRA	0.54 HRA	Rockwell Test Blocks ASTM E18
	70 HRA to 78 HRA	0.68 HRA	
	79 HRA to 84 HRA	0.57 HRA	
	40 HRBW to 59 HRBW	0.54 HRBW	
	60 HRBW to 79 HRBW	0.58 HRBW	
	80 HRBW to 100 HRBW	0.64 HRBW	
	20 HRC to 30 HRC	0.58 HRC	
	35 HRC to 55 HRC	0.59 HRC	
	60 HRC to 65 HRC	0.54 HRC	
	70 HREW to 79 HREW	0.61 HREW	
	83 HREW to 90 HREW	0.58 HREW	
	93 HREW to 100 HREW	0.58 HREW	
	70 HR15 to 77 HR15	0.57 HR15	
	78 HR15 to 88 HR15	0.66 HR15	
	90 HR15 to 92 HR15	0.55 HR15	
	42 HR30N to 50 HR30N	0.68 HR30N	
	55 HR30N to 73 HR30N	0.66 HR30N	
	77 HR30N to 82 HR30N	0.60 HR30N	
	20 HR45N to 31 HR45N	0.55 HR45N	
	37 HR45N to 61 HR45N	0.54 HR45N	
66 HR45N to 72 HR45N	0.54 HR45N		
74 HR15TW to 80 HR15TW	0.54 HR15TW		



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Indirect Verification Rockwell Hardness <sup>FO</sup>	81 HR15TW to 86 HR15TW	0.60 HR15TW	Rockwell Test Blocks ASTM E18
	87 HR15TW to 93 HR15TW	0.76 HR15TW	
	43 HR30TW to 56 HR30TW	0.59 HR30TW	
	57 HR30TW to 69 HR30TW	0.66 HR30TW	
	70 HR30TW to 83 HR30TW	0.65 HR30TW	
Brinell Hardness 10 mm Ball <sup>FO</sup>	HBW 500 kg	1.5 HBW	Brinell Test Blocks ASTM E10
	HBW 1 000 kg	1.2 HBW	
	HBW 3 000 kg (0 to 173)	1.5 HBW	
	HBW 3 000 kg (174 to 395)	4.9 HBW	
	HBW 3 000 kg (396 to 561)	7.4 HBW	

### Thermodynamic

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Temperature Infrared Thermometer <sup>FO</sup>	38 °C to 600 °C	2.8 °C	IR-564 Black Body Source IR-300 Control NAVAIR 17-20ST-220
	601 °C to 1 100 °C	4.9 °C	
	1 101 °C to 1 200 °C	5.9 °C	
Temperature Measure <sup>F</sup>	0 °C to 419 °C	0.035 °C	Fluke 5624 PRT Fluke 1586A ASTM E220
	420 °C to 660 °C	0.049 °C	
	661 °C to 962 °C	0.077 °C	
	-200 °C to -37 °C	0.066 °C	Fluke 5615 PRT Fluke 1586A ASTM E220
		-36 °C to 0 °C	
	0.01 °C to 200 °C	0.047 °C	Fluke 5609 PRT Fluke 1586A ASTM E220
	201 °C to 420 °C	0.081 °C	
	-200 °C to 0 °C	0.046 °C	
	0.01 °C to 419 °C	0.045 °C	Fluke 5605 S Thermocouple Fluke 7526A ASTM E220
	420 °C to 660 °C	0.067 °C	
	50 °C to 749 °C	0.3 °C	
	750 °C to 999 °C	1.0 °C	
	1 000 °C to 1 450 °C	0.7 °C	





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### Thermodynamic

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Relative Humidity Instruments <sup>F</sup>	0.5 % RH	2.4 % RH	Calibration Salts T.O. 33K5-4-84-1
	20 % RH	2.5 % RH	
	50 % RH	2.6 % RH	
	80 % RH	2.8 % RH	
	95 % RH	2.6 % RH	

### Time & Frequency

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Digital Stop Watches and Timers <sup>FO</sup>	1 s to 24 hr	0.24 s / 24 hr	NIST 960-12 Land Line SP 960-12
Analog Stop Watches and Timers <sup>FO</sup>	5 s to 24 hr	1.3 s / 24 hr	

- 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.
- 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.
- The presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location. Example: Outside Micrometer<sup>F</sup> would mean that the laboratory performs this calibration at its fixed location.
- 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<sup>FO</sup> would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.



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5. Measurement uncertainties obtained for calibrations performed at customer sites can be expected to be larger than the measurement uncertainties obtained at the laboratories fixed location for similar calibrations. This is due to the effects of transportation of the standards and equipment and upon environmental conditions at the customer site which are typically not controlled as closely as at the laboratories fixed location.
6. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.
7. The term "X" preceded by a number represents the number of times a lense system magnifies an image relative to its actual size. CMC stated as "% of magnification" represents the CMC of magnification expressed as a percentage of the total magnification.

