

PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

**CTC, Inc.
1719 E 28th St
Signal Hill, CA 90755**

(Hereinafter called the Organization) and hereby declares that Organization 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 (as outlined by the joint ISO-FLAC-IAF Communiqué dated January 2009):

***Electrical, Time and Frequency, Thermodynamic, Weighing Equipment,
Dimensional and Mechanical Calibration
(As detailed in the supplement)***

Such testing and/or calibration services shall only be offered at or from the address given above. 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:

The validity of this certificate is mandated through ongoing surveillance.

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
26555 Evergreen, Suite 1325
Southfield, Michigan 48076

Initial Accreditation Date:

October 02, 2003

Issue Date:

April 24, 2008

Revision Date:

February 03, 2009

Expiration Date:

April 23, 2010

Accreditation No.

59211

Certificate No.

L08-18-R1

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Certificate of Accreditation: Supplement

CTC, Inc.
1719 E 28th St
Signal Hill, CA 90755

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

Electrical

MEASURED QUANTITY, INSTRUMENT OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	REMARKS
DC Voltage Generate	0 mV to 329.999 9 mV	0.06 mV	Fluke 5500A
	330.0 mV to 3.3 V	0.02 mV	
	3.3 V to 33 V	0.000 2 V	
	33 V to 330 V	0.002 V	
	330 V to 1 020 V	0.02 V	
DC Current Generate	0 mA to 3.299 99 mA	0.13 mA	Fluke 8508A/01
	3.3 mA to 33 mA	0.000 6 mA	
	33 mA to 330 mA	0.007 mA	
	330 mA to 2.2 A	0.036 mA	
	2.2 A to 11 A	0.000 7 A	
DC Voltage Measure	0 mV to 199.999 999 mV	1.2 μ V	Fluke 8508A/01
DC Current Measure	0 μ A to 199.999 99 μ A	7.5 μ A	
	0 mA to 1.999 999 9 mA	7.5 μ A	
	0 mA to 19.999 999 mA	8.5 μ A	
	0 mA to 199.999 99 mA	32 μ A	
	0 A to 1.999 999 9 A	88 μ A	
AC Voltage Generate 1 mV to 33 mV	10 Hz to 45 Hz	0.023 mV	Fluke 5500A
	45 Hz to 10 kHz	0.022 mV	
	10 kHz to 20 kHz	0.022 mV	
	20 kHz to 50 kHz	0.023 mV	
	50 kHz to 100 kHz	0.037 mV	
	100 kHz to 500 kHz	0.043 mV	
AC Voltage Generate 33 mV to 330 mV	10 Hz to 45 Hz	0.14 mV	Fluke 5500A
	45 Hz to 10 kHz	0.037 mV	
	10 kHz to 20 kHz	0.053 mV	
	20 kHz to 50 kHz	0.093 mV	
	50 kHz to 100 kHz	0.25 mV	
	100 kHz to 500 kHz	0.56 mV	

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AC Voltage Generate 330 mV to 3.3 V	10 Hz to 45 Hz	0.75 mV	Fluke 5500A
	45 Hz to 10 kHz	1.1 mV	
	10 kHz to 20 kHz	0.32 mV	
	20 kHz to 50 kHz	0.76 mV	
	50 kHz to 100 kHz	2.5 mV	
	100 kHz to 500 kHz	5 mV	
AC Voltage Generate 3.3 V to 33 V	10 Hz to 45 Hz	0.0075 V	
	45 Hz to 10 kHz	0.002 V	
	10 kHz to 20 kHz	0.005 V	
	20 kHz to 50 kHz	0.006 V	
	50 kHz to 100 kHz	0.025 V	
AC Voltage Generate 33 V to 330 V	45 Hz to 10 kHz	0.023 V	
	1 kHz to 5 kHz	0.026 V	
	10 kHz to 20 kHz	0.03 V	
AC Voltage Generate 330 V to 1 020 V	45 Hz to 1 kHz	0.25 V	
	1 kHz to 5 kHz	0.66 V	
	5 kHz to 10 kHz	0.66 V	
AC Current Generate 0.03 mA to 0.33 mA	10 Hz to 20 Hz	0.0002 mA	
	20 Hz to 45 Hz	0.0002 mA	
	45 Hz to 1 kHz	0.0003 mA	
	1 kHz to 5 kHz	0.0003 mA	
	5 kHz to 10 kHz	0.0005 mA	
AC Current Generate 0.33 mA to 3.3 mA	10 Hz to 20 Hz	0.001 mA	
	20 Hz to 45 Hz	0.001 mA	
	45 Hz to 1 kHz	0.001 mA	
	1 kHz to 5 kHz	0.001 mA	
	5 kHz to 10 kHz	0.002 mA	
AC Current Generate 3.3 mA to 33 mA	10 Hz to 20 Hz	0.01 mA	
	20 Hz to 45 Hz	0.01 mA	
	45 Hz to 1 kHz	0.01 mA	
	1 kHz to 5 kHz	0.016 mA	
	5 kHz to 10 kHz	0.023 mA	

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AC Current Generate 33 mA to 330 mA	10 Hz to 20 Hz	0.1 mA	Fluke 5500A
	20 Hz to 45 Hz	0.06 mA	
	45 Hz to 1 kHz	0.06 mA	
	1 kHz to 5 kHz	0.10 mA	
	5 kHz to 10 kHz	0.23 mA	
AC Current Generate 0.33 A to 2.2 A	10 Hz to 45 Hz	0.001 A	
	45 Hz to 1 kHz	0.000 6 A	
	1 kHz to 5 kHz	0.002 8 A	
AC Current Generate 2.2 A to 11 A	45 Hz to 65 Hz	0.003 A	
	65 Hz to 500 Hz	0.004 A	
	500 Hz to 1 kHz	0.009 A	
AC Voltage Measure 0 mV to 199.999 9 mV	1 Hz to 10 Hz	150 μ V	Fluke 8508A/01
	10 Hz to 40 Hz	100 μ V	
	40 Hz to 100 Hz	80 μ V	
	100 Hz to 2 kHz	50 μ V	
	2 kHz to 10 kHz	80 μ V	
	10 kHz to 30 kHz	280 μ V	
	30 kHz to 100 kHz	500 μ V	

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Resistance Generate	0 Ω to 11 Ω	0.008 Ω	Fluke 5500A
	11 Ω to 33 Ω	0.016 Ω	
	33 Ω to 110 Ω	0.018 Ω	
	110 Ω to 330 Ω	0.025 Ω	
	330 Ω to 1.1 k Ω	0.09 Ω	
	1.1 k Ω to 3.3 k Ω	0.16 Ω	
	3.3 k Ω to 11 k Ω	0.90 Ω	
	11 k Ω to 33 k Ω	0.002 k Ω	
	33 k Ω to 110 k Ω	0.001 k Ω	
	110 k Ω to 330 k Ω	0.02 k Ω	
	330 k Ω to 1.1 M Ω	0.11 k Ω	
	1.1 M Ω to 3.3 M Ω	0.22 k Ω	
	3.3 M Ω to 11 M Ω	0.003 M Ω	
	11 M Ω to 33 M Ω	0.012 M Ω	
	33 M Ω to 110 M Ω	0.17 M Ω	
110 M Ω to 330 M Ω	0.58 M Ω		
Capacitance Source	0.33 nF to 0.5 nF	0.012 nF	
	0.5 nF to 1.1 nF	0.013 nF	
	1.1 nF to 3.3 nF	0.016 nF	
	3.3 nF to 11 nF	0.027 nF	
	11 nF to 33 nF	0.13 nF	
	33 nF to 110 nF	0.18 nF	
	110 nF to 330 nF	0.58 nF	
	0.33 μ F to 1.1 μ F	0.002 μ F	
	1.1 μ F to 3.3 μ F	0.000 7 μ F	
	3.9 μ F to 11 μ F	0.022 μ F	
	11 μ F to 33 μ F	0.074 μ F	
	33 μ F to 110 μ F	0.27 μ F	
	110 μ F to 330 μ F	1.1 μ F	
330 μ F to 1.1 mF	3.6 μ F		

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Electrical Simulation of Thermocouples Source and Measure Type B	600 °C to 800 °C	0.44 °C	Fluke 5500A
	800 °C to 1 000 °C	0.34 °C	
	1 000 °C to 1 550 °C	0.30 °C	
	1 550 °C to 1 820 °C	0.33 °C	
Electrical Simulation of Thermocouples Source and Measure Type C	0 °C to 150 °C	0.30 °C	
	150 °C to 650 °C	0.26 °C	
	650 °C to 1 000 °C	0.31 °C	
	1 000 °C to 1 800 °C	0.50 °C	
	1 800 °C to 2 316 °C	0.84 °C	
Electrical Simulation of Thermocouples Source and Measure Type E	-196 °C to -100 °C	0.50 °C	
	-100 °C to -25 °C	0.16 °C	
	-25 °C to 350 °C	0.14 °C	
	350 °C to 650 °C	0.16 °C	
	650 °C to 1 000 °C	0.21 °C	
Electrical Simulation of Thermocouples Source and Measure Type J	-196 °C to -100 °C	0.27 °C	
	-100 °C to -30 °C	0.16 °C	
	-30 °C to 150 °C	0.14 °C	
	150 °C to 760 °C	0.17 °C	
	760 °C to 1 200 °C	0.23 °C	
Electrical Simulation of Thermocouples Source and Measure Type K	-196 °C to -100 °C	0.33 °C	
	-100 °C to -25 °C	0.18 °C	
	-25 °C to 120 °C	0.16 °C	
	120 °C to 1 000 °C	0.26 °C	
	1 000 °C to 1 372 °C	0.40 °C	
Electrical Simulation of Thermocouples Source and Measure Type L	-196 °C to -100 °C	0.37 °C	
	-100 °C to 800 °C	0.26 °C	
	800 °C to 900 °C	0.17 °C	
Electrical Simulation of Thermocouples Source and Measure Type N	-196 °C to -100 °C	0.40 °C	
	-100 °C to -25 °C	0.22 °C	
	-25 °C to 120 °C	0.19 °C	
	120 °C to 410 °C	0.18 °C	
	410 °C to 1 300 °C	0.27 °C	

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Electrical Simulation of Thermocouples Source and Measure Type R	0 °C to 250 °C	0.57 °C	Fluke 5500A
	250 °C to 400 °C	0.35 °C	
	400 °C to 1 000 °C	0.33 °C	
	1 000 °C to 1 767 °C	0.40 °C	
Electrical Simulation of Thermocouples Source and Measure Type S	0 °C to 250 °C	0.47 °C	
	250 °C to 1 000 °C	0.36 °C	
	1 000 °C to 1 400 °C	0.37 °C	
	1 400 °C to 1 767 °C	0.46 °C	
Electrical Simulation of Thermocouples Source and Measure Type T	-196 °C to -150 °C	0.63 °C	
	-150 °C to 0 °C	0.24 °C	
	0 °C to 120 °C	0.16 °C	
	120 °C to 400 °C	0.14 °C	
Electrical Simulation of Thermocouples Source and Measure Type U	-196 °C to 0 °C	0.56 °C	
	0 °C to 600 °C	0.27 °C	
Electrical Simulation of RTD Source Type Pt 385, 100 Ω	-196 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.07 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.10 °C	
	400 °C to 630 °C	0.12 °C	
Electrical Simulation of RTD Source Pt 385, 200 Ω	630 °C to 800 °C	0.14 °C	
	-196 °C to 0 °C	0.04 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.12 °C	
	300 °C to 400 °C	0.13 °C	
	400 °C to 600 °C	0.14 °C	
600 °C to 630 °C	0.16 °C		

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Electrical Simulation of RTD Source Pt 385, 500 Ω	-196 °C to 0 °C	0.04 °C	Fluke 5500A
	0 °C to 100 °C	0.05 °C	
	100 °C to 260 °C	0.06 °C	
	260 °C to 300 °C	0.06 °C	
	300 °C to 400 °C	0.08 °C	
	400 °C to 600 °C	0.09 °C	
	600 °C to 630 °C	0.11 °C	
Electrical Simulation of RTD Source Pt 385, 1 k Ω	-196 °C to 0 °C	0.03 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.06 °C	
	300 °C to 400 °C	0.07 °C	
	400 °C to 600 °C	0.07 °C	
	600 °C to 630 °C	0.23 °C	
Electrical Simulation of RTD Source PtNi 385, 120 Ω (Ni 120)	-80 °C to 0 °C	0.08 °C	
	0 °C to 100 °C	0.08 °C	
	100 °C to 260 °C	0.09 °C	
Electrical Simulation of RTD Source Pt 3916, 100 Ω	-196 °C to 190 °C	0.25 °C	
	-190 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.06 °C	
	100 °C to 260 °C	0.07 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.07 °C	
	400 °C to 600 °C	0.10 °C	
	600 °C to 630 °C	0.23 °C	
Electrical Simulation of RTD Source Pt 3926, 100 Ω	-196 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.07 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.10 °C	
	400 °C to 630 °C	0.12 °C	
Electrical Simulation of RTD Source Cu 427, 10 Ω	-100 °C to 260 °C	0.30 °C	

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Temperature Measurement 25 Ω PRT/SPRT	-196 $^{\circ}\text{C}$	0.008 5 $^{\circ}\text{C}$	Fluke 8508A/01 (4 wire, current reversal)
	0 $^{\circ}\text{C}$	0.003 5 $^{\circ}\text{C}$	
Temperature Measurement 100 Ω PRT/SPRT	-196 $^{\circ}\text{C}$	0.003 5 $^{\circ}\text{C}$	
	0 $^{\circ}\text{C}$	0.002 5 $^{\circ}\text{C}$	

Thermodynamic

MEASURED QUANTITY, INSTRUMENT OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	REMARKS
Temperature Measurement Baths/ Ovens/ Furnaces/ Freezers and Thermometers	-80 $^{\circ}\text{C}$ to 0 $^{\circ}\text{C}$	0.025 $^{\circ}\text{C}$	
	0 $^{\circ}\text{C}$ to 105 $^{\circ}\text{C}$	0.055 $^{\circ}\text{C}$	
	105 $^{\circ}\text{C}$ to 600 $^{\circ}\text{C}$	0.35 $^{\circ}\text{C}$	
Infrared Black Body Generate	25 $^{\circ}\text{C}$ to 1 050 $^{\circ}\text{C}$	1.6 $^{\circ}\text{C}$	
Relative Humidity Generate Probe Kit, Saturated Salts	0.5 % RH at 23 $^{\circ}\text{C}$	0.5 % RH	
	50 % RH at 23 $^{\circ}\text{C}$	0.9 % RH	
	80 % RH at 23 $^{\circ}\text{C}$	1.2 % RH	

Time and Frequency

MEASURED QUANTITY, INSTRUMENT OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	REMARKS
Time Interval Measurement	0 s to 60 s	0.081 s	
	60 s to 3 600 s	0.23 s	
	1 h to 24 h	0.4 s	

Mass, Force, and Weighing Devices

MEASURED QUANTITY, INSTRUMENT OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	REMARKS
Scales and Balances	1 g to 2.29 kg	0.87 g + 0.6R	ASTM Class 7 Weights

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Dimensional

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Micrometers: Inside, Outside and Depth	0.0 mm to 25.4 mm (0.0 in to 1.0 in)	1.7 μ m (65 μ in)	
	25.4 mm to 152.4 mm (1 in to 6 in)	2.0 μ m (78 μ in)	
	(6 in to 24 in)	[(65 + 8L) μ in]	
Calipers, Height Gages	0.0 mm to 154.2 mm (0.0 in to 6 in)	7.7 μ m (300 μ in)	
	154.2 mm to 304.8 mm (6 in to 12 in)	13 μ m (500 μ in)	
	304.8 mm to 1.524 m (12 in to 60 in)	18 μ m (700 μ in)	
Dial Indicator	0.001 27 mm to 25.4 mm (0.000 05 in to 1.0 in)	0.2 μ m (8 μ in)	
	25.4 mm to 152.4 mm (1 in to 6 in)	2.4 μ m (94.5 μ in)	
Gage Blocks	0.01 in to 1.0 in	[(3.6 + 0.8L) μ in]	
	1 in to 8 in	[(4.0 + 0.8L) μ in]	
Length Standards	0 in to 24 in	[(50 + 2L) μ in]	
Protractors	0° to 90°	10"	

Mechanical

MEASURED QUANTITY, INSTRUMENT OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	REMARKS
Hardness HRB	Low	1.0 HRB	
	Middle	1.0 HRB	
	High	1.0 HRB	
Hardness HRC	Low	1.0 HRC	
	Middle	1.0 HRC	
	High	0.5 HRC	
Hardness HRE	Low	1.0 HRE	
	Middle	1.0 HRE	
	High	1.0 HRE	

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Mechanical

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Hardness HR15T	Low	0.35 HR15T	
	Middle	0.24 HR15T	
	High	0.24 HR15T	
Hardness HR30T	Low	0.46 HR30T	
	Middle	0.22 HR30T	
	High	0.18 HR30T	
Hardness HR45T	Low	1.0 HR45T	
	Middle	1.0 HR45T	
	High	1.0 HR45T	
Hardness HR15N	Low	0.35 HR15N	
	Middle	0.24 HR15N	
	High	0.24 HR15N	
Hardness HR30N	Low	0.23 HR30N	
	Middle	0.27 HR30N	
	High	0.17 HR30N	
Hardness HR45N	Low	1.0 HR45N	
	Middle	1.0 HR45N	
	High	1.0 HR45N	
Pneumatic Pressure Gage	0.0 Pa to 29.82 kPa (0 in H ₂ O to 200 in H ₂ O)	0.13 % of full scale	
	0.0 kPa to 2.07 MPa (0 psig to 300 psig) 33K6-4-427-1	0.04 % of reading	
Hydraulic Pressure Gage	0 MPa to 68.95 MPa (0 psig to 10 000 psig) 33K6-4-427-1	0.12 % of reading	
Vacuum Gages	-100.408 kPa to 0 kPa (-30 inHg to 0 inHg)	0.04 % of reading	

1. Remarks: This column shall include pertinent information about the calibration of the Measured Instrument or parameter. The information should include the type of standards used and any pertinent information about the measurement method. This column is not to be used for commercial advertisement of laboratory services.
2. The term R represents the resolution of the device under test.
3. The term L represents length in inches or millimeters appropriate to the uncertainty statement.