



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

Certified Test Equipment, Inc.

708 Cooper Drive, Wylie, TX 75098

(Hereinafter called the Organization) and hereby declares that Organization 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 (as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

Acoustic, Chemical, Dimensional, Electrical, Time and Frequency, Mechanical and Optical 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

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

Initial Accreditation Date:

April 14, 2004

Issue Date:

October 28, 2024

Expiration Date:

February 28, 2027

Accreditation No.:

59237

Certificate No.:

L24-826

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.pjllabs.com



Certificate of Accreditation: Supplement

Certified Test Equipment, Inc.

708 Cooper Drive, Wylie, TX 75098
 Contact Name: John Collinsworth Phone: 972-429-3722

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

Acoustic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Sound level meters (at the listed frequencies) ^{FO}			GR 1562A	33K3-4-2873-1
125 Hz	114 dB	0.67 dB		
250 Hz	114 dB	0.67 dB		
500 Hz	114 dB	0.67 dB		
1 000 Hz	114 dB	0.67 dB		
2 000 Hz	114 dB	0.67 dB		
1 000 Hz	94 dB	0.58 dB	Cel Inst. CEL-284/2B	33K3-4-3477-1

Chemical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
pH meter/Probe Calibration Fixed Points ^{FO}	4 pH	0.43 % of reading	pH Buffer Solutions & Fluke 743B	33K8-4-1110-1
	7 pH	0.43 % of reading		
	10 pH	0.43 % of reading		
Conductivity Meter Fixed Points Measured at 25 °C ^{FO}	23 μ s/cm	0.65 % of reading	Conductivity Solutions & Fluke 743B	
	84 μ s/cm	0.65 % of reading		
	447 μ s/cm	0.65 % of reading		
	1 413 μ s/cm	0.65 % of reading		
	2 070 μ s/cm	0.65 % of reading		
	2 764 μ s/cm	0.65 % of reading		
	12 800 μ s/cm	0.65 % of reading		
80 000 μ s/cm	0.65 % of reading			

Dimensional

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Micrometers, Outside ^{FO}	0.05 in to 24 in	500 μ in	Gage Block Set	33K6-4-1-1
Micrometers, Depth ^{FO}	0.05 in to 24 in	500 μ in		
Micrometers, Inside ^{FO}	1.5 in to 12 in	500 μ in		
Calipers ^{FO}	0.05 in to 12 in	500 μ in		
	12 in to 48 in	1 000 μ in		
Height Gages ^{FO}	0 in to 18 in	250 μ in	Mitutoyo LH-600E Height master	NA17-20MD-26



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Thread Ring Gage Pitch Diameter ^{FO}	0-80 to 2-6	250 μ m	Thread setting Standard	FED STD H28/20
Thread Plug Gages Pitch Diameter ^{FO}	0-80 to 2-6	1 000 μ m	Optical Comparator Thread Wire Set	Fed Std H28/20
Major Diameter ^{FO}	0.04 in to 2 in	1 000 μ m	Super Micrometer	33K6-4-981-1
Dial Indicators ^{FO}	0 in to 2 in	150 μ m	Dial Indicator Calibrator	NA17-20MD-29
Test Indicators ^{FO}	0 in to 0.125 in	150 μ m		
Cylindrical Plug Gages Class XXX ^{FO}	0.06 in to 0.825 in	73 μ m	Laser Micrometer	MP-I-MA03/REV 1
	0.83 in to 1.51 in	74 μ m		
	1.51 in to 10 in	(65.9 + 8.5L) μ m	Gage Block Set and Comparator	33K6-4-1-1/ NA17-20MD-1
Cylindrical Plug Gages ^{FO}	0.06 in to 0.83 in	89 μ m	Laser Micromete	MP-I-MA03/REV 1
	0.83 in to 1.51 in	95 μ m	Gage Block Set and Comparator	33K6-4-1-1/ NA17-20MD-1
	1.51 in to 10 in	(73.2 + 14.7L) μ m		
Cylindrical Ring Gages ^{FO}	0.06 in to 0.83 in	28 μ m	Gage Block Set and Comparator	33K6-4-1-1/ NA17-20MD-1
	0.83 in to 1.51 in	34 μ m		
	1.51 in to 10 in	(49.7 + 20L) μ m		
Gage Blocks – Grade 3 ^{FO}	0.05 in to 4 in	(2.7 + 0.8L) μ m	Comparator and Master Blocks	33K6-4-1-1/ NA17-20MD-1

Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Equipment to Output AM Modulated Signals (at the listed frequencies) ^{FO}			Boonton 8210	33K3-4-3070-1
50 Hz to 5 kHz	10 % to 90 %	1.5 % of reading		
5 kHz to 7.5 kHz	10 % to 90 %	3 % of reading		
Equipment to Output FM Modulated Signals (at the listed frequencies) ^{FO}				
50 Hz to 5 kHz	10 % to 90 %	0.5 % of reading		
5 kHz to 7.5 kHz	10 % to 90 %	1 % of reading		



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Equipment to measure AC Voltage (at the listed frequencies) ^{FO}			Wavetek 9100	33K8-4-15-1
10 Hz to 3 kHz	0.1 mV to 10 mV	0.02 % of setting + 384 V		
3 kHz to 10 kHz	0.1 mV to 10 mV	0.02 % of setting + 512 μ V		
10 kHz to 30 kHz	0.1 mV to 10 mV	0.03 % of setting + 960 μ V		
30 kHz to 50 kHz	0.1 mV to 10 mV	0.05 % of setting + 1.92 mV		
50 kHz to 100 kHz	0.1 mV to 10 mV	0.1 % of setting + 5.12 mV		
Equipment to measure AC Voltage (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	10 mV to 32 mV	0.02 % of setting + 96 V		
3 kHz to 10 kHz	10 mV to 32 mV	0.02 % of setting + 128 μ V		
10 kHz to 30 kHz	10 mV to 32 mV	0.03 % of setting + 240 μ V		
30 kHz to 50 kHz	10 mV to 32 mV	0.1 % of setting + 480 μ V		
50 Hz to 100 kHz	10 mV to 32 mV	0.1 % of setting + 1.28 mV		
Equipment to measure AC Voltage (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	32 mV to 320 mV	0.02 % of setting + 19.2 V		
3 kHz to 10 kHz	32 mV to 320 mV	0.02 % of setting + 25.6 μ V		
10 kHz to 30 kHz	32 mV to 320 mV	0.03 % of setting + 48 μ V		
30 kHz to 50 kHz	32 mV to 320 mV	0.05 % of setting + 96 μ V		
50 kHz to 100 kHz	32 mV to 320 mV	0.1 % of setting + 256 μ V		
Equipment to measure AC Voltage (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	0.32 V to 3.2 V	0.02 % of setting + 192 V		
3 kHz to 10 kHz	0.32 V to 3.2 V	0.02 % of setting + 256 μ V		
10 kHz to 30 kHz	0.32 V to 3.2 V	0.03 % of setting + 480 μ V		
30 kHz to 50 kHz	0.32 V to 3.2 V	0.1 % of setting + 960 μ V		
50 kHz to 100 kHz	0.32 V to 3.2 V	0.1 % of setting + 2.56 mV		
Equipment to measure AC Voltage (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	3.2 V to 32 V	0.02 % of setting + 1.92 mV		
3 kHz to 10 kHz	3.2 V to 32 V	0.03 % of setting + 2.56 mV		
10 kHz to 30 kHz	3.2 V to 32 V	0.04 % of setting + 4.8 mV		
30 kHz to 50 kHz	3.2 V to 32 V	0.1 % of setting + 9.6 mV		
50 kHz to 100 kHz	3.2 V to 32 V	0.2 % of setting + 32 mV		



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Equipment to measure AC Voltage (at the listed frequencies) ^{FO}			Wavetek 9100	33K8-4-15-1
10 Hz to 3 kHz	32 V to 105 V	0.02 % of setting + 6.3 mV		
3 kHz to 10 kHz	32 V to 105 V	0.03 % of setting + 8.4 mV		
10 kHz to 30 kHz	32 V to 105 V	0.04 % of setting + 15.8 mV		
30 kHz to 50 kHz	32 V to 105 V	0.08 % of setting + 31.5 mV		
50 kHz to 100 kHz	32 V to 105 V	0.18 % of setting + 105 mV		
Equipment to measure AC Voltage (at the listed frequencies) ^{FO}				
40 Hz to 100 Hz	105 V to 320 V	0.03 % of setting + 19.2 mV		
100 Hz to 1 kHz	105 V to 320 V	0.03 % of setting + 19.2 mV		
1 kHz to 3 kHz	105 V to 320 V	0.04 % of setting + 19.2 mV		
3 kHz to 10 kHz	105 V to 320 V	0.04 % of setting + 32 mV		
10 kHz to 20 kHz	105 V to 320 V	0.06 % of setting + 48 mV		
20 kHz to 30 kHz	105 V to 320 V	0.08 % of setting + 64 mV		
Equipment to measure AC Voltage (at the listed frequencies) ^{FO}				
40 Hz to 100 Hz	320 V to 800 V	0.03 % of setting + 63 mV		
100 Hz to 1 kHz	320 V to 800 V	0.03 % of setting + 63 mV		
1 kHz to 3 kHz	320 V to 800 V	0.04 % of setting + 63 mV		
3 kHz to 10 kHz	320 V to 800 V	0.04 % of setting + 105 mV		
10 kHz to 20 kHz	320 V to 800 V	0.06 % of setting + 158 mV		
20 kHz to 30 kHz	320 V to 800 V	0.08 % of setting + 210 mV		
Equipment to measure AC Voltage (at the listed frequencies) ^{FO}				
40 Hz to 100 Hz	800 V to 1 050 V	0.03 % of setting + 126 mV		
100 Hz to 1 kHz	800 V to 1 050 V	0.03 % of setting + 126 mV		
1 kHz to 3 kHz	800 V to 1 050 V	0.04 % of setting + 126 mV		
3 kHz to 10 kHz	800 V to 1 050 V	0.04 % of setting + 210 mV		
10 kHz to 20 kHz	800 V to 1 050 V	0.06 % of setting + 315 mV		
50 kHz to 110 kHz	800 V to 1 050 V	0.08 % of setting + 50 μ V	HP 745A/HP 746A	NA17-20AQ-59



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Equipment to output AC Voltage (at the listed frequencies) ^{FO}			HP 3458A	33K8-4-1053-1
1 Hz to 10 Hz	2 mV to 200 mV	0.05 % of reading + 30 V		
10 Hz to 50 Hz	2 mV to 200 mV	0.02 % of reading + 30 V		
50 Hz to 10 kHz	2 mV to 200 mV	0.02 % of reading + 30 V		
10 kHz to 30 kHz	2 mV to 200 mV	0.02 % of reading + 30 V		
30 kHz to 50 kHz	2 mV to 200 mV	0.03 % of reading + 30 V		
50 kHz to 100 kHz	2 mV to 200 mV	0.38 % of reading + 30 V		
100 kHz to 200 kHz	2 mV to 200 mV	0.15 % of reading + 50 V		
0.2 MHz to 1 MHz	2 mV to 200 mV	1 % of reading + 200 μ V		
1 MHz to 2 MHz	2 mV to 200 mV	2.5 % of reading + 400 μ V		
Equipment to output AC Voltage (at the listed frequencies) ^{FO}				
1 Hz to 10 Hz	200 mV to 2 V	0.05 % of reading + 300 V		
10 Hz to 50 Hz	200 mV to 2 V	0.02 % of reading + 300 V		
50 Hz to 10 kHz	200 mV to 2 V	0.02 % of reading + 300 V		
10 kHz to 30 kHz	200 mV to 2 V	0.02 % of reading + 300 V		
30 kHz to 50 kHz	200 mV to 2 V	0.03 % of reading + 300 V		
50 kHz to 100 kHz	200 mV to 2 V	0.15 % of reading + 300 V		
100 kHz to 200 kHz	200 mV to 2 V	0.38 % of reading + 500 V		
0.2 MHz to 1 MHz	200 mV to 2 V	1 % of reading + 2 mV		
1 MHz to 2 MHz	200 mV to 2 V	2.5 % of reading + 4 mV		
Equipment to output AC Voltage (at the listed frequencies) ^{FO}				
1 Hz to 10 Hz	2 V to 20 V	0.05 % of reading + 3 mV		
10 Hz to 50 Hz	2 V to 20 V	0.03 % of reading + 3 mV		
50 Hz to 2 kHz	2 V to 20 V	0.02 % of reading + 3 mV		
2 kHz to 10 kHz	2 V to 20 V	0.03 % of reading + 3 mV		
10 kHz to 30 kHz	2 V to 20 V	0.04 % of reading + 3 mV		
30 kHz to 50 kHz	2 V to 20 V	0.05 % of reading + 3 mV		
50 kHz to 100 kHz	2 V to 20 V	0.15 % of reading + 3 mV		
100 kHz to 200 kHz	2 V to 20 V	0.38 % of reading + 5 mV		
0.2 MHz to 1 MHz	2 V to 20 V	2 % of reading + 40 mV		
1 MHz to 2 MHz	2 V to 20 V	3.5 % of reading + 40 mV		



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Equipment to output AC Voltage (at the listed frequencies) ^{FO}			HP 3458A	33K8-4-1053-1
1 Hz to 10 Hz	20 V to 200 V	0.05 % of reading + 30 mV		
10 Hz to 50 Hz	20 V to 200 V	0.03 % of reading + 30 mV		
50 Hz to 2 kHz	20 V to 200 V	0.02 % of reading + 30 mV		
2 kHz to 10 kHz	20 V to 200 V	0.03 % of reading + 30 mV		
10 kHz to 30 kHz	20 V to 200 V	0.04 % of reading + 30 mV		
30 kHz to 50 kHz	20 V to 200 V	0.05 % of reading + 30 mV		
50 kHz to 100 kHz	20 V to 200 V	0.15 % of reading + 30 mV		
100 kHz to 200 kHz	20 V to 200 V	0.38 % of reading + 50 mV		
0.2 MHz to 1 MHz	20 V to 200 V	2 % of reading + 400 mV		
Equipment to output AC Voltage (at the listed frequencies) ^{FO}				
1 Hz to 10 Hz	200 V to 750 V	0.07 % of reading + 0.112 5 V		
10 Hz to 50 Hz	200 V to 750 V	0.05 % of reading + 0.112 5 V		
50 Hz to 2 kHz	200 V to 750 V	0.04 % of reading + 0.112 5 V		
2 kHz to 10 kHz	200 V to 750 V	0.05 % of reading + 0.112 5 V		
10 kHz to 30 kHz	200 V to 750 V	0.06 % of reading + 0.112 5 V		
30 kHz to 50 kHz	200 V to 750 V	0.08 % of reading + 0.112 5 V		
50 kHz to 100 kHz	200 V to 750 V	0.25 % of reading + 0.112 5 V		
Equipment to Measure AC Current (at the listed frequencies) ^{FO}			Wavetek 9100	33K8-4-15-1
10 Hz to 3 kHz	0.01 μ A to 32 μ A	0.04 % of setting + 900 nA		
3 kHz to 10 kHz	0.01 μ A to 32 μ A	0.05 % of setting + 1.8 μ A		
10 kHz to 20 kHz	0.01 μ A to 32 μ A	0.10 % of setting + 6 μ A		
20 kHz to 30 kHz	0.01 μ A to 32 μ A	0.13 % of setting + 9 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	32.001 μ A to 320 μ A	0.04 % of setting + 300 nA		
3 kHz to 10 kHz	32.001 μ A to 320 μ A	0.05 % of setting + 600 nA		
10 kHz to 20 kHz	32.001 μ A to 320 μ A	0.10 % of setting + 2 μ A		
20 kHz to 30 kHz	32.001 μ A to 320 μ A	0.13 % of setting + 3 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	0.320 01 mA to 3.2 mA	0.04 % of setting + 300 nA		
3 kHz to 10 kHz	0.320 01 mA to 3.2 mA	0.05 % of setting + 600 nA		
10 kHz to 20 kHz	0.320 01 mA to 3.2 mA	0.10 % of setting + 2 μ A		
20 kHz to 30 kHz	0.320 01 mA to 3.2 mA	0.13 % of setting + 3 μ A		



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Equipment to Measure AC Current (at the listed frequencies) ^{FO}			Wavetek 9100	33K8-4-15-1
10 Hz to 3 kHz	3.200 01 mA to 32 mA	0.04 % of setting + 3.2 μ A		
3 kHz to 10 kHz	3.200 01 mA to 32 mA	0.05 % of setting + 6.4 μ A		
10 kHz to 20 kHz	3.200 01 mA to 32 mA	0.10 % of setting + 12.8 μ A		
20 kHz to 30 kHz	3.200 01 mA to 32 mA	0.13 % of setting + 22.4 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	32.00 1 mA to 320 mA	0.04 % of setting + 32 μ A		
3 kHz to 10 kHz	32.00 1 mA to 320 mA	0.05 % of setting + 48 μ A		
10 kHz to 20 kHz	32.00 1 mA to 320 mA	0.10 % of setting + 64 μ A		
20 kHz to 30 kHz	32.00 1 mA to 320 mA	0.13 % of setting + 96 μ A		
Equipment to Measure AC Current (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	0.321 A to 3.2 A	0.05 % of setting + 480 μ A		
3 kHz to 10 kHz	0.321 A to 3.2 A	0.13 % of setting + 2.56 mA		
Equipment to Measure AC Current (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	3.21 A to 10.5 A	0.10 % of setting + 3 mA		
3 kHz to 10 kHz	3.21 A to 10.5 A	0.25 % of setting + 10 mA		
Equipment to Measure AC Current (at the listed frequencies) ^{FO}				
10 Hz to 3 kHz	10.500 1 A to 20 A	0.10 % of setting + 6.9 mA		
3 kHz to 10 kHz	10.500 1 A to 20 A	0.25 % of setting + 23 mA		
Equipment to Output AC Current (at the listed frequencies) ^{FO}			Keithley 2001	33K8-4-1053-1
20 Hz to 50 Hz	0.01 μ A to 200 μ A	0.18 % of reading + 30 nA		
50 Hz to 200 Hz	0.01 μ A to 200 μ A	0.10 % of reading + 30 nA		
200 Hz to 1 kHz	0.01 μ A to 200 μ A	0.20 % of reading + 30 nA		
1 kHz to 10 kHz	0.01 μ A to 200 μ A	0.25 % of reading + 30 nA		
Equipment to Output AC Current (at the listed frequencies) ^{FO}				
20 Hz to 50 Hz	210 μ A to 2 mA	0.15 % of reading + 0.3 μ A		
50 Hz to 200 Hz	210 μ A to 2 mA	0.08 % of reading + 0.3 μ A		
200 Hz to 1 kHz	210 μ A to 2 mA	0.06 % of reading + 0.3 μ A		
1 kHz to 10 kHz	210 μ A to 2 mA	0.06 % of reading + 0.3 μ A		



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Equipment to Output AC Current (at the listed frequencies) ^{FO}			Keithley 2001	33K8-4-1053-1
20 Hz to 50 Hz	2.1 mA to 20 mA	0.15 % of reading + 3 μ A		
50 Hz to 200 Hz	2.1 mA to 20 mA	0.08 % of reading + 3 μ A		
200 Hz to 1 kHz	2.1 mA to 20 mA	0.06 % of reading + 3 μ A		
1 kHz to 10 kHz	2.1 mA to 20 mA	0.06 % of reading + 3 μ A		
Equipment to Output AC Current (at the listed frequencies) ^{FO}			HP 3458A	33K8-4-1053-1/ 33K1-4-785-1
20 Hz to 50 Hz	21 mA to 200 mA	0.15 % of reading + 30 μ A		
50 Hz to 200 Hz	21 mA to 200 mA	0.08 % of reading + 30 μ A		
200 Hz to 1 kHz	21 mA to 200 mA	0.06 % of reading + 30 μ A		
1 kHz to 10 kHz	21 mA to 200 mA	0.08 % of reading + 30 μ A		
Equipment to Output AC Current (at the listed frequencies) ^{FO}				33K8-4-1053-1
20 Hz to 50 Hz	210 mA to 2 A	0.18 % of reading + 300 μ A		
50 Hz to 200 Hz	210 mA to 2 A	0.10 % of reading + 300 μ A		
200 Hz to 1 kHz	210 mA to 2 A	0.15 % of reading + 300 μ A		
1 kHz to 10 kHz	210 mA to 2 A	0.23 % of reading + 300 μ A		
Equipment to Output AC Current (at the listed frequencies) ^{FO}				33K8-4-1053-1
20 Hz to 10 kHz	2 A to 600 A	1.000 6 % of reading + 0.5A		
Resistance in Ohms - Source(4 Wire) ^{FO}	0 Ω to 20 Ω	0.002 6 % of reading + 0.000 14 Ω		
	21 Ω to 200 Ω	0.001 8 % of reading + 0.001 4 Ω		
	0.21 k Ω to 2 k Ω	0.001 65 % of reading + 0.008 Ω		
	2.1 k Ω to 20 k Ω	0.001 6 % of reading + 0.08 Ω		
Resistance in Ohms - Source(2 Wire) ^{FO}	21 k Ω to 200 k Ω	0.003 6 % of reading + 0.9 Ω		
	210 k Ω to 2 M Ω	0.005 5 % of reading + 9 Ω		
	2.1 M Ω to 20 M Ω	0.03 % of reading + 90 Ω		
	21 M Ω to 200 M Ω	0.5 % of reading + 20 k Ω		
Resistance in Ohms - Source(4 Wire) ^{FO}	210 M Ω to 1 G Ω	1 % of reading + 100 k Ω		
	0.001 Ω	1.5 x 10 ⁻⁴ % of reading	L&N 4223	33K8-4-183-1
	1 Ω	7.5 x 10 ⁻⁴ % of reading	L&N 4210	33K8-4-125-1
	10 Ω	5 x 10 ⁻⁴ % of reading	L&N 4025B	
100 Ω	5 x 10 ⁻⁴ % of reading	L&N 4030B		



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Resistance in Ohms - Source(4 Wire) ^{FO}	10 k Ω	7×10^{-4} % of reading	ESI SR104	33K8-4-183-1
	1 Ω to 100 Ω	2.9×10^{-3} % of reading	ESI SR1010-10	33K8-4-125-1
	10 Ω to 1 k Ω	5.9×10^{-3} % of reading	ESI SR1010-100	
	100 Ω to 10 k Ω	1.2×10^{-3} % of reading	ESI SR1010-1k	
	1 k Ω to 100 k Ω	7×10^{-4} % of reading	ESI SR1010-10k	
	10 k Ω to 1 M Ω	8×10^{-4} % of reading	ESI SR1010-100k	
Equipment to Measure Inductance (@ 1 kHz) ^{FO}	500 μ H	0.05 % of reading	GR 1482D QuadTech 1920 LCR	33K8-4-19-1 NA17-20AZ-111
	5 mH	0.05 % of reading	GR 1482G QuadTech 1920 LCR	
	50 mH	0.04 % of reading	GR 1482K QuadTech 1920 LCR	
	500 mH	0.05 % of reading	GR 1482N QuadTech 1920 LCR	
	5 H	0.05 % of reading	GR 1482R QuadTech 1920 LCR	
	5 H to 10 H	0.39 % of reading	GR 1490D QuadTech 1920 LCR	33K8-4-130-1 NA17-20AZ-111
Equipment to Output Capacitance ^{FO}	0 pF to 1.2 pF	5×10^{-3} % of reading + 0.000 1 pF	ESI 707B QuadTech 1920 LCR	33K8-4-8-1 NA17-20AZ-111
	1.21 pF to 120 pF	5×10^{-3} % of reading + 0.001 pF		
	121 pF to 1 200 pF	5×10^{-3} % of reading + 0.01 pF		
	1 201 pF to 0.012 μ F	5×10^{-3} % of reading + 0.1 pF		
	0. 012 μ F to 0.12 μ F	5×10^{-3} % of reading + 1 pF		
	0.12 μ F to 1.2 μ F	0.01 % of reading + 10 pF		



Certificate of Accreditation: Supplement

Certified Test Equipment, Inc.

708 Cooper Drive, Wylie, TX 75098
 Contact Name: John Collinsworth Phone: 972-429-3722

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Electrical

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Equipment to Output Capacitance ^{FO}	1 μ F to 1 mF	0.2 % of reading + 0.001 mF	HP 4282A QuadTech 1920 LCR 04282-99001	NA17-20AZ-111
	10 mF	0.5 % of reading + 0.01 mF		
	100 mF	0.75 % of reading + 0.5 mF		
	1 F	1.2 % of reading + 0.01 F		
Equipment to Measure Capacitance ^{FO}	0.1 pF	0.05 % of reading	GR 1403N QuadTech 1920 LCR	33K8-4-131-1 NA17-20AZ-111
	10 pF	0.05 % of reading	Boonton CS-10	33K8-4-1-4-52
	50 pF	0.05 % of reading	Boonton CS-50	
	100 pF	0.05 % of reading	Boonton CS-100	
	1 000 pF	0.01 % of reading	GR 1404A	33K8-4-35-1
	0.1 μ F to 10 μ F	0.13 % of reading	GR 1424A	TB9-6625-1062-35
Equipment to Measure Optical Power ^{FO}			Ando AQ1336	33K4-4-394-1
1 310 nm	0.1 mW to 9.999 mW	4.9 μ W/cm ²		
1 550 nm	0.1 mW to 9.999 mW	0.02 mW/cm ²		
Equipment to Output Optical Power ^{FO}			Laser Precision AM 4000 w/ AM-420	33K4-395-1
1 310 nm	0.1 mW to 9.999 mW	1.5 % of reading		
1 550 nm	0.1 mW to 9.999 mW	1.5 % of reading		
Equipment to Measure DC Voltage ^{FO}	1 mV to 100 mV	6 x 10 ⁻³ % of setting + 4.16 μ V	Fluke 335A	33K8-4-323-1
	0.1 V to 10 V	1 x 10 ⁻³ % of setting + 10 μ V		
	11 V to 100 V	1 x 10 ⁻³ % of setting + 20 μ V		
	110 V to 1 000 V	1 x 10 ⁻³ % of setting + 200 μ V		
Equipment to Output DC Voltage ^{FO}	0.01 mV to 200 mV	3.7 x 10 ⁻³ % of reading + 120 μ V	HP 3458A	33K8-4-1053-1
	210 mV to 2 V	2.5 x 10 ⁻³ % of reading + 400 μ V		
	2.1 V to 20 V	2.4 x 10 ⁻³ % of reading + 8 mV		
	21 V to 200 V	3.8 x 10 ⁻³ % of reading + 63 mV		
	210 V to 1 000 V	4.1 x 10 ⁻³ % of reading + 660 mV		
	1 001 V to 100 000 V	0.1 % of reading + 600 mV	HP 3458A & Spellman HVD100	33K8-4-1053-1 33K1-4-1820-1



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Equipment to Measure DC Current ^{FO}	0.01 μ A to 320 μ A	0.01 % of setting + 11 nA	HP 3458A	33K8-4-1053-1
	0.320 01 mA to 3.2 mA	0.01 % of setting + 83 nA		
	3.200 1 mA to 32 mA	0.01 % of setting + 900 nA		
	32.001 mA to 320 mA	0.01 % of setting + 9.6 μ A		
	0.320 01 A to 3.2 A	0.03 % of setting + 118 μ A		
	3.21 A to 10.5 A	0.03 % of setting + 940 μ A		
	10.51 A to 20 A	0.03 % of setting + 4.5 mA		
Equipment to Output DC Current ^{FO}	0.001 μ A to 200 μ A	0.03 % of reading + 2.5 μ A	HP 3458A with L&N 4360	33K8-4-1053-1 33K8-4-225-1
	210 μ A to 2 mA	0.02 % of reading + 2 μ A		
	2.1 mA to 20 mA	0.02 % of reading + 2 μ A		
	21 mA to 200 mA	0.03 % of reading + 2 μ A		
	210 mA to 2 A	0.05 % of reading + 2 μ A		
	2 A to 15 A	0.05 % of reading + 2 μ A		
	15 A to 300 A	0.05 % of reading + 2 μ A		
300 A to 1 000 A	1 % of reading + 0.5 A	HP 3458A with Fluke 11010	33K8-4-1053-1 33K1-4-785-1	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J ^{FO}	-210 $^{\circ}$ C to -100 $^{\circ}$ C	0.28 $^{\circ}$ C	Wavetek 9100	Electrical Simulation of Thermocouple Output ITS-90 Reference Table NIST Monograph 175
	-100 $^{\circ}$ C to 800 $^{\circ}$ C	0.23 $^{\circ}$ C		
	800 $^{\circ}$ C to 1 000 $^{\circ}$ C	0.24 $^{\circ}$ C		
	1 000 $^{\circ}$ C to 1 200 $^{\circ}$ C	0.26 $^{\circ}$ C		
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K ^{FO}	-250 $^{\circ}$ C to -200 $^{\circ}$ C	0.58 $^{\circ}$ C	Wavetek 9100	Electrical Simulation of Thermocouple Output ITS-90 Reference Table NIST Monograph 175
	-200 $^{\circ}$ C to -100 $^{\circ}$ C	0.30 $^{\circ}$ C		
	-100 $^{\circ}$ C to 100 $^{\circ}$ C	0.23 $^{\circ}$ C		
	100 $^{\circ}$ C to 600 $^{\circ}$ C	0.26 $^{\circ}$ C		
	600 $^{\circ}$ C to 1 372 $^{\circ}$ C	0.30 $^{\circ}$ C		
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type R ^{FO}	0 $^{\circ}$ C to 100 $^{\circ}$ C	0.53 $^{\circ}$ C	Wavetek 9100	Electrical Simulation of Thermocouple Output ITS-90 Reference Table NIST Monograph 175
	100 $^{\circ}$ C to 200 $^{\circ}$ C	0.42 $^{\circ}$ C		
	200 $^{\circ}$ C to 1 600 $^{\circ}$ C	0.37 $^{\circ}$ C		
	1 600 $^{\circ}$ C to 1 767 $^{\circ}$ C	0.31 $^{\circ}$ C		



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Electrical

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Temperature Calibration, Indication and Control Equipment used with Thermocouple Type T ^{FO}	-250 °C to -200 °C	0.60 °C	Wavetek 9100	Electrical Simulation of Thermocouple Output ITS-90 Reference Table NIST Monograph 175
	-200 °C to -100 °C	0.30 °C		
	-100 °C to 0.0 °C	0.25 °C		
	0 °C to 400 °C	0.21 °C		
Temperature Calibration, Indication and Control Equipment used with RTD Pt 385 100 Ω ^{FO}	-100 °C to 100 °C	0.10 °C	Wavetek 9100	Electrical Simulation of RTD Output PT385, IPTS-68 AS PER IEC 751
	100 °C to 630 °C	0.20 °C		
	630 °C to 850 °C	0.30 °C		
Equipment to Output RF ^{FO} Power 50 MHz to 26.5 GHz	1 μ W to 100 mW	4.2 %	HP 438A w/ HP 8485A	33K4-4-144-1 ETMS-50250001-1.72.1703-2703

Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Direct Verification of Durometer Hardness Tester Types A, B, C, D ^{FO}			Optical Comparator 20X Mitutoyo 516-422 Grade 2 Gage Block Set	NA17-20MD-20 33K6-4-1-1
Extension at Zero Reading	2.46 mm to 2.54 mm	0.02 mm		
Indentor Shape ^{FO}			Optical Comparator 20X	NA17-20MD-20
A, B, C, D Indentor Diameter	1.27 mm	0.06 mm		
A, C Indentor Tip Diameter	0.79 mm	0.02 mm		
B, D Indentor Tip Diameter	0.1 mm	0.01 mm		
A, C Indentor Tip Angle	35 °	0.13 °		
B, D Indentor Tip Angle	30 °	0.25 °		
Durometer Indentor Spring ^{FO}			Sartorius QS4000	NA17-20MM-01
Types A, B	0.55 N to 8.05 N	0.04 N		
Types C, D	4.45 N to 44.45 N	0.22 N		
Indirect Verification of Rockwell Hardness Testers HRA ^{FO}	20 HRA to 40 HRA	0.6 HRA	Calibrated Rockwell Hardness Test Blocks	ASTM E 18-8
	40 HRA to 60 HRA			
	60 HRA to 85 HRA			



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Mechanical

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Indirect Verification of Rockwell Hardness Testers HRB ^{FO}	40 HRB to 60 HRB	1.5 HRB	Calibrated Rockwell Hardness Test Blocks	ASTM E 18-8
	60 HRB to 80 HRB	1.1 HRB		
	80 HRB to 100 HRB			
Indirect Verification of Rockwell Hardness Testers HRC ^{FO}	25 HRC to 35 HRC	1.1 HRC		
	35 HRC to 55 HRC	0.9 HRC		
	55 HRC to 65 HRC	0.7 HRC		
Indirect Verification of Rockwell Hardness Testers HRD ^{FO}	40 HRD to 50 HRD	0.6 HRD		
	50 HRD to 60 HRD			
	60 HRD to 75 HRD			
Indirect Verification of Rockwell Hardness Testers HR15N ^{FO}	70 HR15N to 80 HR15N	0.7 HR15N		
	80 HR15N to 90 HR15N			
Indirect Verification of Rockwell Hardness Testers HR30N ^{FO}	40 HR30N to 50 HR30N	1.1 HR30N		
	50 HR30N to 60 HR30N			
	60 HR30N to 75 HR30N			
Indirect Verification of Rockwell Hardness Testers HR45N ^{FO}	20 HR45N to 37 HR45N	0.6 HR45N		
	37 HR45N to 55 HR45N			
	55 HR45N to 70 HR45N			
Indirect Verification of Rockwell Hardness Testers HR15T ^{FO}	60 HR15T to 65 HR15T	0.9 HR15T		
	65 HR15T to 70 HR15T			
	70 HR15T to 75 HR15T			
Indirect Verification of Rockwell Hardness Testers HR30T ^{FO}	15 HR30T to 40 HR30T	1.5 HR30T		
	40 HR30T to 65 HR30T			
	65 HR30T to 90 HR30T			
Indirect Verification of Rockwell Hardness Testers HR45T ^{FO}	10 HR45T to 37 HR45T	0.8 HR45T		
	37 HR45T to 65 HR45T			
	65 HR45T to 90 HR45T			
Torque Watches ^{FO}	0.5 ozf·in to 360 ozf·in	0.5 % of reading	Class 7 Weight Set, Torque Arm	33K6-4-450-1
Torque Drivers & Wrenches ^{FO}	90 lbf·in to 900 lbf·in	1.6 % of reading	Norbar TWA 100/A Skidmore Wilhelm WD	NA17-20MU-52
	15 lbf·ft to 150 lbf·ft			



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Torque Transducers ^{FO}	0.1 ozf·in to 366 ozf·in	0.57 % of reading	Class 7 Weight Set, Torque Arm	33K6-4-450-1
	0.1 lbf·in to 900 lbf·in	0.51 % of reading		
	2 lbf·ft to 150 lbf·ft			
Viscometers- Kinematic, Zahn, Shell, Ford, ISO & DIN Cups @ 25 °C ^{FO}	17.57 mm ² /s	0.44 %	Cannon C10 Fluke 743B – Temperature Measurement Robic Stopwatch I010P029	33K8-4-1110-1
	33.69 mm ² /s	0.44 %	Cannon C20 Robic Stopwatch Fluke 743B – Temperature Measurement I010P029	
	119.1 mm ² /s	0.45 %	Cannon C60 Robic Stopwatch Fluke 743B – Temperature Measurement I010P029	
	232 mm ² /s	0.45 %	Cannon C100 Robic Stopwatch Fluke 743B – Temperature Measurement I010P029	
	392 mm ² /s	0.45 %	Cannon C200 Robic Stopwatch Fluke 743B – Temperature Measurement I010P029	
Viscometers- Dynamic, Rotary, Thomas Stormer, ICI Cone Plate 15 °C to 45 °C ^{FO}	309.4 mPa·s to 369.1 mPa·s	0.45 % of reading	Cannon S200KU Fluke 743B – Temperature Measurement I010P029	
	991.6 mPa·s to 1 206 mPa·s	0.47 % of reading	Cannon S600KU Fluke 743B – Temperature Measurement I010P029	



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Viscometers- Dynamic, Rotary, Thomas Stormer, ICI Cone Plate 15 °C to 45 °C ^{FO}	71.7 mPa•s to 106.1 mPa•s	0.44 % of reading	Cannon RT100 Fluke 743B – Temperature Measurement I010P029	33K8-4-1110-1
	731.4 mPa•s to 1 090 mPa•s	0.45 % of reading	Cannon RT1000 Fluke 743B – Temperature Measurement I010P029	
	3 651 mPa•s to 5 419 mPa•s	0.47 % of reading	Cannon RT5000 Fluke 743B – Temperature Measurement I010P029	
	8 842 mPa•s to 13 150 mPa•s	0.47 % of reading	Cannon RT12500 Fluke 743B – Temperature Measurement I010P029	
Vacuum Gages ^{FO}	-28.5 inHg to 0 inHg	0.1 inHg + 0.13 % of reading	Hass A-1 Barometer	NA17-20MD-216
Pressure Gages Pneumatic ^{FO}	0.20 psi to 15 psi	0.06 psi	Wallace & Tiernan FA154	33K6-4-557-1
Pressure Gages Hydraulic ^{FO}	15 psi to 100 psi	0.05 psi	Fluke 743B w/700P06	See note 5 33K8-4-1110-1
	100 psi to 500 psi	0.13 % of reading	Mansfield & Green T-1 Dual Range	
	500 psi to 5 000 psi			
	5 000 psi to 10 000 psi	0.67 % of reading	Ashcroft 1305N	
Low Pressure ^{FO}	0.05 H ₂ O to 0.25 H ₂ O	0.5 % of reading	Dwyer 115	33K6-4-557-1
	0.02 H ₂ O to 3 H ₂ O		Dwyer 209	
	0.1 H ₂ O to 40 H ₂ O	0.36 % of reading	Dwyer 477-2	33K6-4-692-1



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

Mass, Force & Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Force (Tension & Compression) ^{FO}	0.1 lb to 100 lb	0.25 % of reading	Class 7 Weight Set	NA17-20MM-04
	100 lb to 5 000 lb	0.26 % of reading	Transducer Tech. SW-5K	33K6-4-3196-1
Force (Compression) ^{FO}	5 000 lb to 50 000 lb	0.25 % of reading	Transducer Tech. HSW-50K	
Bench Scales ^{FO}	0.01 g to 200 g	0.97 mg	Class 4 Weight Set	NA17-20MM-04
	0. 201 kg to 4.99 kg	0.09 g		
	5 kg to 226.8 kg	210 g		
Floor Scales ^{FO}	227 kg to 2 270 kg	500 g	Class 7 Weight Set	

Time and Frequency

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Equipment to Measure Frequency ^{FO}	0.01 Hz to 20 MHz	2.5×10^{-4} % of setting	HP 3325A	33K3-4-192-1
	0.01 GHz to 2 GHz	4.1×10^{-2} % of setting	HP 8642M	33K4-4-377-1
	2 GHz to 26 GHz	5.5×10^{-5} % of setting	HP 8673A	33K4-4-343-1
Equipment to Output Frequency ^{FO}	0.01 Hz to 100 MHz	2.7×10^{-2} % of reading	HP 5334B	33K3-4-451-1
	100 MHz to 40 GHz	1.0×10^{-4} % of reading	EIP 548A	33K4-4-230-1

Thermodynamic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Temperature Measurement Thermocouple Type E ^{FO}	-150 °C to 0 °C	0.02 % of reading °C + 0.2 °C	Ectron 1100	33K5-4-240-1
	0 °C to 1 000 °C	0.02 % of reading °C + 0.3 °C		
Temperature Measurement Thermocouple Type J ^{FO}	-150 °C to 0 °C	0.02 % of reading °C + 0.2 °C		
	0 °C to 1 200 °C	0.02 % of reading °C + 0.3 °C		
Temperature Measurement Thermocouple Type K ^{FO}	-150 °C to 0 °C	0.02 % of reading °C + 0.2 °C		
	0 °C to 1 372 °C	0.02 % of reading °C + 0.2 °C		
Temperature Measurement Thermocouple Type T ^{FO}	-150 °C to 0 °C	0.02 % of reading °C + 0.2 °C		
	0 °C to 400 °C	0.02 % of reading °C + 0.2 °C		
Equipment to Measure Humidity at 15 °C to 30 °C ^{FO}	11 % RH	1.5 %	Humidity Salt Solutions	CP00426
	33 % RH	1.2 %		
	76 % RH			



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

1. 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.
2. 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.
3. The presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location.
4. The presence of a superscript O means that the laboratory performs calibration of the indicated parameter onsite at customer locations.
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