PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

Assurance Technologies, Inc.

1760 Britannia Drive, Suite 1, Elgin, IL 60124

(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):

Calibration of Acoustic, Chemical, Dimensional, Electrical, Mass, Force, and Weighing Devices, Mechanical, Thermodynamic, and Time and Frequency

(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:	*Issue Date:*	*Expiration Date:*
October 01, 2005	July 20, 2024	August 31, 2026

Accreditation No.:	*Certificate No.:*
59361	L24-556

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.pjlabs.com

Certificate of Accreditation: Supplement

Assurance Technologies, Inc.
1760 Britannia Drive, Suite 1, Elgin, IL 60124
Contact Name: Mr. Michael Smith Phone: 630-550-5000

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 (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Sound Level – Source [FO] 100 Hz, 250 Hz, 500 Hz, 1 000 Hz, 2 000 Hz	114 dB	0.15 dB	Gen Rad 1562-A	DP-MET294

Chemical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
pH Meter / Probe Calibration [FO]	4 pH	0.016 pH	Ricca Chemical pH Buffer Solutions	DP-MET242
	7 pH	0.018 pH		
	10 pH	0.021 pH		
Conductivity Meter / Probe Calibration [FO]	84 µS/cm	0.44 µS/cm	Ricca Chemical Conductivity Solutions	
	447 µS/cm	3 µS/cm		
	1 413 µS/cm	8.3 µS/cm		
	8 974 µS/cm	38 µS/cm		
	12 880 µS/cm	62 µS/cm		

Dimensional

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Optical Comparator Linear System X and Y Axis [O]	Up to 900 mm	(0.002 5 mm + 0.000 021L) mm	Glass Scale	DP-MET264 DP-MET265
Video Measuring System Linear Accuracy X and Y Axis [O]	Up to 2 500 mm	(0.001 3 mm + 0.000 004 3L) mm	Glass Scale	DP-MET268
Video Measuring System Z Linear [O]	Up to 400 mm	(1.6 um + 0.002 2L) um	Gage Blocks	
Microscopes [FO]	0.000 5 in to 1 in	120 µin	Glass Scale	DP-MET270
Calibration of Optical & Video Measuring System Using Precision Steel Master Artifacts (Shaft Scanners, Vici, Jenoptik) [FO]	X Axis Up to 180 mm	(0.6 + 0.002 3D) µm	Master Steel Artifact	DP-MET305
	Y Axis Up to 600 mm	(2.9 + 0.002 2L) µm		
Field of View Measuring Systems (Oasis, Keyence) [FO]	Up to 1 in	36 µin	Master Pin Gages	DP-MET271
Bore Gages [FO]	0.236 2 in to 12 in	120 µin	Ring Gage	DP-MET241
Film Coating Thickness Gages [FO]	0.6 mil to 60 mil	0.11 mil	Film Thickness Standards	DP-MET207

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Feeler Gages [F]	0.001 in to 0.2 in	141 µin	ULM	DP-MET231
Gage Blocks [F]	Up to 4”	(5.7 uin + 2.7L) uin) L= in	P&W Laseruler Gage Blocks	DP-MET232
	4 to 23”	(2.5 uin + 3.9L) uin L = in	Mahr PLM600E Gage Blocks	
Height Gages [FO]	0.05 in to 48 in	(540 + 20L) µin	Gage Blocks	DP-MET202
Calipers [FO]	Up to 12 in	(290 uin + 16L) uin L= in		DP-MET219
	12 in to 60 in	(230 uin + 21L) uin L= in	Length Standards	
Form Roundness [F]	Up to 300 mm Diameter (Height Up to 500 mm)	(0.057 + 0.000 35H) µm	Mitutoyo RA-2200AH Roundness Tester	DP-MET306
Flatness [F]	Up to 300 mm Diameter	0.08 µm		
Straightness [F]	Up to 350 mm Long	1.3 µm		
Cylindricity [F]	Up to 300 mm Diameter (Height up to 500 mm)	0.41 µm		
Indicators [FO]	0.002” (Resolution .00002”)	16 uin	Gage Blocks	DP-MET217
	Up to 4” (Resolution 0.0001”)	68 uin		
	Up to 4” (Resolution 0.00005”)	46 uin		
	Up to 4” (Resolution .001”)	580 uin		
Indicators/Linear Gages/ Lever Head Probes[FO]	Up to 0.04” (Resolution 0.00001”)	12 uin		
Outside Micrometers [FO]	Up to 6”	(170 uin + 10L) uin L= in	Gage Blocks Measuring Rods	DP-MET218
	6 to 48”	(76 uin + 23L) µin L= in	Length Standards	
Depth Micrometers [FO]	Up to 12”	(28 uin + 30L) µin L= in	Gage Blocks Length Standards	DP-MET218A
Pin Gages [FO]	0.01 in to 1 in	(30 + 4.4D) µin	Laser Micrometer	DP-MET203
	0.01 in to 8 in	17 µin + 6.23 µin/in	ULM	
Thread Measuring Wires [F]	0.004 in to 1 in	18 µin	ULM	DP-MET262
Thread Plug Gage Pitch Diameter [FO]	Up to 10”	(28 uin + 2.5L) uin L = in	Mahr PLM-600E	DP-MET214
Thread Plug Gage Major Diameter [FO]	M 1.6 x 0.35 to M 100 x 6 0-80 to 4-10	(26 + 15.9D) µin	Supermicrometer	
Thread Rings Pitch Diameter [F]	0.080 to 7 in	(35 uin + 0.5L) uin	Mahr PLM-600E	DP-MET308
Thread Rings Pitch Diameter [FO]	M 1.6 x 0.35 to M 100 x 6 0-80 to 4-10	(180 + 80.71D) µin	Master Threaded Set Plug	DP-MET248

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Thread Rings Minor Diameter [FO]	0.275 in to 4 in	180 uin	Bore Gage	DP-MET248
	Up to 6 in	200 uin	Video Comparator	
Radius Gages [F]	0.01 in to 1 in	(93 + 9.3R) µin	Video Comparator	DP-MET223
Squares [F]	1 in to 12 in	120 µin		DP-MET227
Steel Rules [F]	3 in to 24 in	(90 + 16L) µin		DP-MET210
Glass Scales, Stage Micrometer, Graduated Rules and Reticles [F]	Up to 24 in	(120 uin + 23L) uin		
Setting Masters, 1D [F]	0.015 in to 6 in	(92 + 16D) µin		DP-MET106
Length Measurement Two dimensional gages [FO]	Up to 38 in	(24 uin + 2.1L) uin	Mitutoyo LH-600EG High Accuracy Height Gage	DP-MET309
Penetration Elements (Hex, Slot, Square, Phillips, Hexalobular) [FO]	Up to 12 in	(0.000 16 in + 0.000 012L) in	Video Measuring System	DP-MET250,1,2
Penetration Elements [FO] Type I: 0 to 5 Type IA: 0 to 5 Type II: 1 to 4	0.01 in to 0.5 in 0.015 in to 0.5 in 0.024 in to 0.69 in	(0.000 16 + 0.000 012L) in	Video Comparator	DP-MET252
Hex Penetration Points [FO] Thickness Width Across Corners Width across Flats	0.028 in to 1 in	(0.000 16 + 0.000 012L) in	Video Comparator	DP-MET251
Square Penetration Points Width Across Flats [FO] Type III: 00 to 4	0.049 in to 0.27 in	(0.000 16 + 0.000 012L) in		
Slot Penetration Points [FO] Width of Blade M2 to M10	0.001 in to 0.75 in	(0.000 16 + 0.000 012L) in		
Surface Plates [FO] Repeat Measurements only	0.002 in	43 µin	Repeat–O–Meter	DP-MET220
Coordinate Measuring Machines [O] Linear Accuracy	4 in to 20 in	(32 + 8.4L) µin	Gage Blocks Ball Bar Checkmaster	DP-MET285
	0.5 in to 40 in	60 µin + 3.52 µin/in		
Coordinate Measuring Machines Volumetric Accuracy [O]	4 in to 12 in	140 µin		
	4 in to 20 in	160 µin		
Hole Check, ID [F]	0.01 in to 0.33 in (Resolution: 0.000 1 in)	150 µin	Setting Masters	DP-MET104
Chamfer Check, ID [F]	0.02 in to 4 in (Resolution: 0.000 1 in)	1 600 µin		

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Countersink, ID [F]	0.36 in to 0.78 in (Resolution: 0.000 1 in)	1 200 µin	Setting Masters	DP-MET104
Surface Roughness Specimen R_a [FO]	14 µin to 500 µin	3.6 µin	Surface Finish Analyzer	DP-MET254
Profilometer [FO] Surface Roughness R_a	12 µin to 120 µin	3.5 µin	Roughness Specimen	DP-MET283
Precision Levels [F]	Up to 18”	0.00015 in/ft (150 uin per foot)	Surface Plate with Levelers & Gage Blocks	DP-MET204
Precision Balls [F]	0.125 in to 4 in	(28 + 3.1D) µin	P&W Laseruler	DP-MET236
Plain Rings [F]	Up to 17.5 in	(12 + 2.2D) µin	Mahr PLM 600E Master Rings	DP-MET229
Plain Plugs and Discs	Up to 8”	(5.7 + 2.2L) uin	Mahr PLM600E	DP-MET203
Length Standards [F]	1 in to 10 in	(23 + 13.8L) µin	ULM CMM	DP-MET260
	11 in to 36 in	(77 + 13.6L) µin		
Laser Micrometer [F]	0.000 001 in to 1 in	42 µin	Master Gage Pins	DP-MET296
ULM / Bench Micrometer/ Super Micrometer [F] Linearity Force	0.000 001 in to 12 in Up to 2.5 lbf	(12 +2.7L) µin 0.061 lbf	Master Gage Blocks Master Load Cell	DP-MET282
Mu-Checker / Amplifier [F]	0.000 01 in to 0.1 in	11 µin	Master Gage Blocks	DP-MET282

Electrical

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Gaussmeters [FO]	5 Gauss	0.15 Gauss	Gauss Calibration Standards	DP-MET243
	10 Gauss	0.27 Gauss		
	20 Gauss	0.29 Gauss		
	50 Gauss	1.8 Gauss		
Clamp-On Meters [FO]	Up to 1 000 A DC	0.092 ADC + 0.342 % of reading	Fluke 5522A Fluke 50 Turn Coil	DP-MET246
	Up to 1 000 A AC (45 Hz to 440 Hz)	0.063 ADC + 0.341 % of reading		
Equipment to measure DC Voltage [FO]	0.01 mV to 330 mV	3 µV + 0.004 % of reading	Fluke 5522A	
	330 mV to 3.3 V	5.5 µV + 0.003 2 % of reading		
	3.3 V to 33 V	0.001 1 V + 0.002 % of reading		
	33 V to 330 V	0.01 V + 0.002 2 % of reading		
	330 V to 1 000 V	0.006 V + 0.004 % of reading		

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Equipment to measure DC Current FO	0.25 mA to 330 mA	0.001 2 mA + 0.008 % of reading	Fluke 5522A	DP-MET246
	330 mA to 2.2 A	0.55 mA + 0.009 % of reading		
	2.2 A to 11 A	0.7 mA + 0.001 8 % of reading		
LCR Meters FO	Up to 9H	0.067 % of reading + 0.023 mH	IET LS-400 Inductance Substituter	DP-MET320
Equipment to Measure Resistance FO	0.025 Ω to 11 Ω	0.009 6 Ω + 0.013 % of reading	Fluke 5522A	DP-MET246
	11 Ω to 33 Ω	0.012 Ω + 0.018 % of reading		
	33 Ω to 110 Ω	0.014 Ω + 0.005 % of reading		
	110 Ω to 330 Ω	0.015 Ω + 0.004 % of reading		
	330 Ω to 1.1 kΩ	0.045 Ω + 0.006 % of reading		
	1.1 kΩ to 3.3 k Ω	0.011 kΩ + 0.008 % of reading		
	3.3 kΩ to 11 k Ω	0.001 2 kΩ + 0.003 % of reading		
	11 kΩ to 33 k Ω	0.012 kΩ + 0.008 % of reading		
	33 kΩ to 110 k Ω	0.012 kΩ + 0.006 % of reading		
	110 kΩ to 330 kΩ	1.2 kΩ + 0.001 % of reading		
	330 kΩ to 1 100 kΩ	0.046 kΩ + 0.009 % of reading		
	1.1 MΩ to 3.3 MΩ	0.000 8 MΩ + 0.036 % of reading		
	3.3 MΩ to 11 MΩ	0.001 MΩ + 0.033 % of reading		
	11 MΩ to 33 MΩ	0.095 MΩ + 0.2 % of reading		
	33 MΩ to 110 MΩ	0.005 MΩ + 0.31 % of reading		
Equipment to Measure Capacitance FO	0.33 nF to 11 nF	0.06 nF + 0.12 % of reading		
	11 nF to 330 nF	16 nF + 0.4 % of reading		
	0.33 µF to 11 µF	5.2 nF + 0.3 % of reading		
	11 µF to 330 µF	70 nF + 0.9 % of reading		
	330 µF to 1.1 mF	1.3 µF + 0.7 % of reading		
Equipment to Measure AC Voltage (at the listed frequencies) FO				
10 Hz to 45 Hz	1 mV to 33 mV	0.043 mV + 0.17 % of reading		
45 Hz to 10 kHz	1 mV to 33 mV	0.094 mV + 0.003 % of reading		
10 kHz to 20 kHz	1 mV to 33 mV	0.044 mV + 0.034 % of reading		
20 kHz to 50 kHz	1 mV to 33 mV	0.054 mV + 0.03 % of reading		
50 kHz to 100 kHz	1 mV to 33 mV	0.062 mV + 0.087 % of reading		
100 kHz to 500 kHz	1 mV to 33 mV	0.084 mV + 0.47 % of reading		

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Equipment to Measure AC Voltage (at the listed frequencies) FO			Fluke 5522A	DP-MET246
10 Hz to 45 Hz	33 mV to 330 mV	0.034 mV + 0.025 % of reading		
45 Hz to 10 kHz	33 mV to 330 mV	0.097 mV + 0.013 % of reading		
10 kHz to 20 kHz	33 mV to 330 mV	0.025 mV + 0.059 % of reading		
20 kHz to 50 kHz	33 mV to 330 mV	0.23 mV + 0.096 % of reading		
50 kHz to 100 kHz	33 mV to 330 mV	0.085 mV + 0.15 % of reading		
100 kHz to 500 kHz	33 mV to 330 mV	0.24 mV + 0.024 % of reading		
Equipment to Measure AC Voltage (at the listed frequencies) FO				
10 Hz to 45 Hz	330 mV to 3.3 V	390 µV + 0.03 % of reading		
45 Hz to 10 kHz	330 mV to 3.3 V	53 µV + 0.054 % of reading		
10 kHz to 20 kHz	330 mV to 3.3 V	122 µV + 0.077 % of reading		
20 kHz to 50 kHz	330 mV to 3.3 V	164 µV + 0.12 % of reading		
50 kHz to 100 kHz	330 mV to 3.3 V	38 µV + 0.23 % of reading		
100 kHz to 500 kHz	330 mV to 3.3 V	120 µV + 0.38 % of reading		
Equipment to Measure AC Voltage (at the listed frequencies) FO				
10 Hz to 45 Hz	3.3 V to 33 V	0.000 9 V + 0.022 % of reading		
45 Hz to 10 kHz	3.3 V to 33 V	0.000 6 V + 0.024 % of reading		
10 kHz to 20 kHz	3.3 V to 33 V	0.000 3 V + 0.053 % of reading		
20 kHz to 50 kHz	3.3 V to 33 V	0.13 % of reading		
50 kHz to 100 kHz	3.3 V to 33 V	0.18 % of reading		
Equipment to Measure AC Voltage (at the listed frequencies) FO				
45 Hz to 1 kHz	33 V to 330 V	0.034 % of reading		
1 kHz to 10 kHz	33 V to 330 V	0.053 % of reading		
10 kHz to 20 kHz	33 V to 330 V	0.067 % of reading		
Equipment to Measure AC Voltage (at the listed frequencies) FO				
45 Hz to 1 kHz	330 V to 1 000 V	0.01 V + 0.05 % of reading		
1 kHz to 5 kHz	330 V to 1 000 V	0.16 % of reading		
5 kHz to 10 kHz	330 V to 1 000 V	0.2 % of reading		

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Equipment to Measure AC Current (at the listed frequencies) FO			Fluke 5522A	DP-MET246
10 Hz to 20 Hz	33 µA to 330 µA	0.18 µA + 0.13 % of reading		
20 Hz to 45 Hz	33 µA to 330 µA	0.24 µA + 0.034 % of reading		
45 Hz to 1 kHz	33 µA to 330 µA	0.23 µA + 0.066 % of reading		
1 kHz to 5 kHz	33 µA to 330 µA	0.17 µA + 0.14 % of reading		
5 kHz to 10 kHz	33 µA to 330 µA	0.12 µA + 0.73 % of reading		
Equipment to Measure AC Current (at the listed frequencies) FO				
10 Hz to 1 kHz	330 µA to 3.3 mA	0.97 µA + 0.044 % of reading		
1 kHz to 5 kHz	330 µA to 3.3 mA	0.84 µA + 0.1 % of reading		
5 kHz to 10 kHz	330 µA to 3.3 mA	1 µA + 0.38 % of reading		
Equipment to Measure AC Current (at the listed frequencies) FO				
10 Hz to 1 kHz	3.3 mA to 33 mA	0.13 % of reading		
1 kHz to 5 kHz	3.3 mA to 33 mA	0.2 % of reading		
5 kHz to 10 kHz	3.3 mA to 33 mA	0.39 % of reading		
Equipment to Measure AC Current (at the listed frequencies) FO				
10 Hz to 1 kHz	33 mA to 330 mA	0.14 % of reading		
1 kHz to 5 kHz	33 mA to 330 mA	0.67 % of reading		
5 kHz to 10 kHz	33 mA to 330 mA	0.38 % of reading		
Equipment to Measure AC Current (at the listed frequencies) FO				
10 Hz to 5 kHz	330 mA to 2.2 A	0.65 % of reading		
Equipment to Measure AC Current (at the listed frequencies) FO				
10 Hz to 1 kHz	2.2 A to 11 A	0.26 % of reading		
Equipment to Measure AC Current (at the listed frequencies) FO				
45 Hz to 5 kHz	11 A to 20 A DC	0.62 % of reading		
	11 A to 20 A AC	3.61 % of reading		
Equipment to Output AC Voltage (at the listed frequencies) FO			7.5 Digit Multimeter / Keysite 34470A Fluke High Voltage Probe (above 1 kV)	DP-MET226
3 Hz to 1 kHz	0.001 mV to 100 mV	0.081 mV		
1 kHz to 50 kHz	0.001 mV to 100 mV	0.08 mV + 0.07 % of reading		
50 kHz to 300 kHz	0.001 mV to 100 mV	0.046 % of reading		

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Equipment to Output AC Voltage (at the listed frequencies) FO			7.5 Digit Multimeter Keysite 34470A Fluke High Voltage Probe (above 1 kV)	DP-MET226
3 Hz to 1kHz	100 mV to 1 V	0.018 µV + 0.081 % of reading		
1 kHz to 50 kHz	100 mV to 1 V	0.12 % of reading		
50 kHz to 300 kHz	100 mV to 1 V	1.27 % of reading		
Equipment to Output AC Voltage (at the listed frequencies) FO				
3 Hz to 1kHz	1 V to 10 V	0.04 µV + 0.081 % of reading		
1 kHz to 50 kHz	1 V to 10 V	0.06 µV + 0.12 % of reading		
50 kHz to 300 kHz	1 V to 10 V	0.58 µV + 1.27 % of reading		
Equipment to Output AC Voltage (at the listed frequencies) FO				
3 Hz to 1 kHz	10 V to 100 V	0.93 µV + 0.081 % of reading		
1 kHz to 50 kHz	10 V to 100 V	0.12 µV + 0.12 % of reading		
Equipment to Output AC Voltage (at the listed frequencies) FO				
3 Hz to 1 kHz	100 V to 750 V	0.081 % of reading		
Equipment to Output AC Current (at the listed frequencies) FO				
3 Hz to 5 kHz	0.01 µA to 100 µA	0.15 µA		
	100 µA to 10 mA	0.000 13 µA + 0.15 % of reading		
	10 mA to 100 mA	0.000 21 µA + 0.05 % of reading		
	100 mA to 1 A	0.18 % of reading		
	1 A to 10 A	0.35 % of reading		
Equipment to Output AC Voltage @ 60Hz	1 kV to 10 kV	0.021 kV + 5.6 % of reading		
Oscilloscopes FO			Fluke 5820A	DP-MET299
Amplitude DC Signal 50 Ω Load 1 MΩ Load	1 mV to 6.6 V	0.005 8 mV + 0.272 % of reading		
	1 mV to 130 V	0.58 mV + 0.029 % of reading		
Amplitude AC Signal Square Wave 50 Ω Load	1 mV to 6.6 V_{p-p} (10 Hz to 1 kHz)	0.58 V + 0.281 % of reading		
1 MΩ Load	1 mV to 130 mV_{p-p} (10 Hz to 1 kHz)	1.3 mV + 0.006 % of reading		
Rise Time	720 ps	180 ps		
Leveled Sine Wave 50 kHz to 2.1 GHz	5 mV to 5 V	0.002 6 V + 6.94 % of reading		

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Equipment to Output DC Voltage FO	0.000 1 mV to 100 mV	0.008 7 mV	7.5 Digit Multimeter / Keysite 34470A Fluke High Voltage Probe (above 1 kV)	DP-MET226
	100 mV to 1 V	0.028 mV		
	1 V to 10 V	0.21 mV		
	10 V to 100 V	0.005 1 V		
	100 V to 1 000 V	0.006 4 % of reading		
	1 kV to 10 kV	1.34 % of reading		
Equipment to Output DC Current FO	0.01 µA to 1 mA	0.068 µA		
	1 mA to 10 mA	0.089 % of reading		
	10 mA to 100 mA	0.001 9 mA + 0.062 % of reading		
	100 mA to 1 A	0.108 % of reading		
	1 A to 10 A	0.284 % of reading		
Equipment to Output Resistance FO	0.001 Ω to 100 Ω	0.012 Ω		
	100 Ω to 1 kΩ	0.006 9 Ω + 0.005 % of reading		
	1 kΩ to 10 kΩ	0.001 6 Ω + 0.005 2 % of reading		
	10 kΩ to 100 kΩ	0.005 3 % of reading		
	100 kΩ to 1 MΩ	0.009 1 % of reading		
	1 MΩ to 10 MΩ	0.003 5 % of reading		
	10 MΩ to 100 MΩ	0.003 8 % of reading		
Temperature Calibration Indication and Control Equipment used with Thermocouple Type B FO	600 ºC to 1 820 ºC	0.38 °C + 0.004 % of reading	Electrical Simulation of Thermocouple Output Fluke 5500	DP-MET263
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type C FO	Up to 2 316 °C	0.38 °C + 0.004 % of reading		
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type E FO	-250 °C to 1 000 °C	0.38 °C + 0.004 % of reading		
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J FO	-210 °C to 1 200 °C	0.38 °C + 0.004 % of reading		
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K FO	-200 °C to 1 372 °C	0.38 °C + 0.004 % of reading		

Certificate of Accreditation: Supplement

Assurance Technologies, Inc.
1760 Britannia Drive, Suite 1, Elgin, IL 60124
Contact Name: Mr. Michael Smith Phone: 630-550-5000

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

Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Temperature Calibration Indication and Control Equipment used with Thermocouple Type L FO	-200 ºC to 900 ºC	0.38 °C + 0.004 % of reading	Electrical Simulation of Thermocouple Output Fluke 5500	DP-MET263
Temperature Calibration Indication and Control Equipment used with Thermocouple Type N FO	-100 ºC to 1 300 ºC	0.38 °C + 0.004 % of reading		
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type R FO	Up to 1 767 °C	0.38 °C + 0.004 % of reading		
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type S FO	Up to 1 767 °C	0.38 °C + 0.004 % of reading		
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type T FO	-250 °C to 400 °C	0.38 °C + 0.004 % of reading		
Temperature Calibration Indication and Control Equipment used with Thermocouple Type U FO	-200 ºC to 600 ºC	0.38 °C + 0.004 % of reading		

Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Balance FO	0.001 g to 500 g	0.000 12 g + 0.000 356 % of reading	Class 1 Weights	DP-MET209A
	500 g to 5 000 g	0.000 379 % of reading		
	5 000 g to 20 000 g	0.000 643 % of reading		
	20 000 g to 90 000 g	0.000 745 % of reading		
Scales FO	0.005 lb to 100 lb	0.003 lb + 0.01 % of reading	Class F Weights	DP-MET209
	100 lb to 1 000 lb	0.000 92 lb + 0.014 8 % of reading		
	1 000 lb to 2 000 lb	0.033 3% of reading		
Force FO	0.1 lbf to 200 lbf	0.13 lbf + 0.24 % of reading	Master Load Cell	DP-MET215
	200 lbf to 500 lbf	0.56 lbf + 0.025 % of reading		
	500 lbf to 1 000 lbf	0.18 % of reading		
	1 000 lbf to 5 000 lbf	13 lbf		
	5 000 lbf to 10 000 lbf	30 lbf		

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Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Force [FO]	0.01 lbf to 10 lbf	0.011 lbf + 0.069 % of reading	Dead Weights	DP-MET215
	10 lbf to 100 lbf	0.051 lbf + 0.063 % of reading		
Force [O]	10 000 lbf to 100 000 lbf	250 lbf + 0.434 % of reading	Master Load Cell	
Mass [F]	0.001 g to 220 g	(0.059 + 0.002 77g) mg	Class 1 Weight Comparison with Mettler Toledo Balance	DP-MET304
	220 g to 1 kg	(0.3 + 0.002 65 g) mg		
	1 kg to 6 kg	(4.2 + 0.002 27 g) mg		
	6 kg to 32 kg	(49 + 0.001 92 g) mg		

Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Tensile Testers [FO]	0.1 lbf to 200 lbf	0.13 lbf + 0.24 % of reading	Load Cell	DP-MET286
	200 lbf to 500 lbf	0.56 lbf + 0.025 % of reading		
	500 lbf to 1 000 lbf	0.18 % of reading		
	1 000 lbf to 5 000 lbf	13 lbf		
	5 000 lbf to 10 000 lbf	30 lbf		
Tensile Testers [O]	10 000 lbf to 100 000 lbf	250 lbf + 0.434 % of reading		
Tensile Crosshead Speed [O]	0.157 5 in/min to 15 in/min	4.9×10^{-2} in/min	Digital Stopwatch Linear Scale	
Tensile Crosshead Travel [O]	0.05 in to 24 in	0.007 in	Linear Scale	
Torque Transducers [FO]	Up to 10 lbf•in	0.000 821 lbf•in + 0.078 9 % of reading	Torque Arm and Weights Class F	DP-MET293
	1 lbf•ft to 200 lbf•ft	0.004 lbf•ft + 0.13 % of reading		
	200 lbf•ft to 650 lbf•ft	0.000 97 lbf•ft + 0.16 % of reading		
Torque Tools [FO]	0.001 oz•in to 10 oz•in	0.016 oz•in + 0.448 % of reading	AWS MTMDP-4L	DP-MET230
	10 oz•in to 50 oz•in	0.008 8 oz•in + 0.575 % of reading		
	0.01 lbf•in to 10 lbf•in	0.008 lbf•in + 0.51 % of reading		
	10 lbf•in to 100 lbf•in	0.011 lbf•in + 0.6 % of reading		
	100 lbf•in to 1 000 lbf•in	0.027 lbf•in + 0.59 % of reading		
	60 lbf•ft to 600 lbf•ft	0.61 % of reading		
	600 lbf•ft to 1 000 lbf•ft	1.6 lbf•ft + 0.549 % of reading		

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Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Pressure – Pnuematic FO	0.1 psi to 10 psi	0.06 psi + 1.23 % of reading	Pressure Calibrator	DP-MET247
	10 psi to 100 psi	0.05 psi + 0.13 % of reading		
	100 psi to 1 000 psi	0.17 psi + 0.13 % of reading		
Pressure – Hydraulic FO	1 000 psi to 10 000 psi	1.4 psi + 0.15 % of reading		
Pressure – Manometer FO	-5 psi to 5 psi	0.005 9 psi		
Vacuum FO	1 mmHg to 760 mmHg	0.6 mmHg	Vacuum Calibrator	DP-MET253
Roundness Measuring Systems O Radial Accuracy Gage Head Calibration Axial Error Coning Error	1 000 µin	3 µin 8.3 µin 2.8 µin 2.9 µin	Precision Sphere Gage Blocks Precision Sphere Precision Sphere	DP-MET297
Indirect Verification of Rockwell Hardness Testers HRA FO	60 HRA to 69 HRA	0.69 HRA	Calibrated Rockwell Hardness Test Blocks	DP-MET255
	69 HRA to 80 HRA	0.49 HRA		
	80 HRA to 84 HRA	0.51 HRA		
Indirect Verification of Rockwell Hardness Testers HRBW FO	10 HRBW to 50 HRBW	1.1 HRBW		
	50 HRBW to 80 HRBW	0.82 HRBW		
	80 HRBW to 100 HRBW	0.69 HRBW		
Indirect Verification of Rockwell Hardness Testers HRC FO	20 HRC to 39 HRC	0.47 HRC		
	39 HRC to 60 HRC	0.48 HRC		
	60 HRC to 68 HRC	0.43 HRC		
Indirect Verification of Rockwell Hardness Testers HRFW FO	40 HRFW to 69 HRFW	0.56 HRFW		
	69 HRFW to 87 HRFW	0.69 HRFW		
	87 HRFW to 100 HRFW	0.68 HRFW		
Rockwell Hardness Testers Indirect Verification HRHW FO	60 HRHW to 87 HRHW	0.6 HRHW		
	87 HRHW to 93 HRHW	0.61 HRHW		
	93 HRHW to 100 HRHW	0.55 HRHW		
Indirect Verification of Rockwell Hardness Testers HR15N FO	60 HR15N to 79 HR15N	0.64 HR15N		
	79 HR15N to 90 HR15N	0.5 HR15N		
	90 HR15N to 92 HR15N	0.41 HR15N		

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Indirect Verification of Rockwell Hardness Testers HR30N FO	40 HR30N to 59 HR30N	0.63 HR30N	Calibrated Rockwell Hardness Test Blocks	DP-MET255
	59 HR30N to 77 HR30N	0.47 HR30N		
	77 HR30N to 82 HR30N	0.42 HR30N		
Indirect Verification of Rockwell Hardness Testers HR45N FO	20 HR45N to 49 HR45N	0.61 HR45N		
	49 HR45N to 67 HR45N	0.52 HR45N		
	67 HR45N to 72 HR45N	0.46 HR45N		
Indirect Verification of Rockwell Hardness Testers HR15TW FO	60 HR15TW to 79 HR15TW	0.99 HR15TW		
	79 HR15TW to 87 HR15TW	1.1 HR15TW		
	87 HR15TW to 93 HR15TW	0.99 HR15TW		
Indirect Verification of Rockwell Hardness Testers HR30TW FO	43 HR30TW to 56 HR30TW	0.85 HR30TW		
	56 HR30TW to 70 HR30TW	1 HR30W		
	70 HR30TW to 83 HR30TW	1 HR30TW		
Indirect Verification of Rockwell Hardness Testers HR45TW FO	1 HR45TW to 17 HR45TW	0.98 HR45TW		
	17 HR45TW to 53 HR45TW	1 HR45TW		
	53 HR45TW to 73 HR45TW	0.98 HR45TW		
Indirect Verification of Rockwell Hardness Testers HRE FO	57 HRE to 71 HRE	1.1 HRE		
	71 HRE to 85 HRE	0.79 HRE		
	85 HRE to 100 HRE	0.54 HRE		
Brinell Hardness Tester Indirect Verification HBW 10/3000 O	92.5 HBW to 650 HBW	4 HBW	Stage Micrometer	DP-MET257
Micro-Hardness Testers Indirect Verification Vickers O	100 HV to 900 HV	15 HV		DP-MET256
Micro-Hardness Testers Indirect Verification Knoop O	100 HK to 900 HK	17 HN		

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Mechanical

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Leebs-Hardness Testers Indirect Verification Vickers [O]	300 HLD to 900 HLD	12 HLD	Test Blocks	DP-MET258
Direct Verification of Durometer Hardness [F] Tester Types A, B, C, D, E, O, DO and IRHD			DP-MET237	DP-MET288
Indentor Extension at Zero Reading	2.46 mm to 2.54 mm	3.5 µm	Video Comparator 20 x	
Indentor Shape (Not all Parameters Apply to All of Durometer Types)				
Indentor Diameter	---	3.5 µm	Video Comparator 20 x	
Indentor Diameter IRHD	---	3.5 µm	Video Comparator 20 x	
Indentor Tip Diameter	---	3.5 µm	Video Comparator 20 x	
Indentor Tip Radius	---	3.5 µm	Video Comparator 20 x	
Indentor Tip Angle	---	0.06°	Video Comparator 20 x	
Durometer Indentor Spring				
Types A, B, E & O	4.4 N to 8.05 N	1.4 N	Load Cell	
Types C, D & DO	4.445 N to 44.45 N	1.4 N	Load Cell	
Type IRHD M	0.001 gf to 31 gf	0.033 gf	DP-MET234	
Types A, B, E & O	0.1 gf to 850 gf	0.47 gf	High Precision Gram Scale	
IRHD N, H, L			High Precision Gram Scale	
Air Velocity Measuring Devices, Anemometers [FO]	400 FPM to 3 200 FPM	1.7 FMP + 0.018f) FPM	Master Anemometer Wind Tunnel	DP-MET303

Time and Frequency

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Stopwatch / Timer [FO]	24 Hours	0.14 s	NIST Landline	DP-MET292
		(0.14 s + 0.14X) s X = s/hr	Master Stopwatch	
Contact Tachometer [F]	55 rpm to 25 000 rpm	0.67 rpm + 0.014 8 % of reading	Comparison to Counter and Tachometer Tester	DP-MET295
Non-Contact Tachometer [F]	Up to 100 000 RPM	0.004 6% + 0.17 rpm	Direct Reflective with Tachometer Tester	
Stroboscope [F]	300 rpm to 29 999 rpm	0.73 rpm + 0.002 13 % of reading	Comparison to Counter and Detector	

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

Thermodynamic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION MEASUREMENT METHOD OR PROCEDURES USED
Oven Calibration [O]	Up to 537.78 ºC	0.97 ºC	SAE AMS 2750D	DP-MET280
Freezer [O]	Down to -80 °C	0.084 °C		
Temperature Measurement Equipment [FO]	25 °C to 300 °C	1.7 °C	Omega Hot Point	DP-MET245
	-30 °C to 200 °C	0.3 °C	Fluke Microbath	
	-30 °C to 300 °C	0.065 °C	Fluke 1552A Thermometer	
Temperature Measuring Devices [FO]	-40 °C to 80 °C	0.14 °C	Vaisala HMP-235	DP-MET315
IR Thermometer [FO]	Up to 572 °C	2.5 °C	Master IR Thermometer Blackbody	DP-MET259
Relative Humidity, Room/Chambers [FO]	Up to 100%	1.6 % RH	Vaisala HMP-235	DP-MET315
Relative Humidity Measuring Devices, Thermohygrometers [F]	10 % RH to 95 % RH	0.71 % RH	Thunder Scientific 2500ST-LT	DP-MET302
Temperature Measuring Devices, Thermohygrometers [F]	-10 °C to 70 °C	0.1 °C		

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.

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

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.

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

6. The term D represents diameter in inches or millimeters as appropriate to the uncertainty statement.

7. The term DL represents diagonal length in inches or millimeters as appropriate to the uncertainty statement.

8. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.

9. For complete calibration of surface plates, repeat measurement accuracy is only valid in conjunction with flatness measurement; however, this check is offered as a service to the customer.