



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

Assurance Technologies, Inc.

1251 Humbracht Circle, Unit A, Bartlett, IL 60103

(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 Chemical, Dimensional, Electrical, Hardness Measuring Equipment, Light, Mass, Mechanical, Pressure, pH, 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:

October 1, 2005

Issue Date:

March 30, 2022

Expiration Date:

May 31, 2024

Accreditation No:

59361

Certificate No:

L22-261

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

Assurance Technologies, Inc.

1251 Humbrecht Circle, Unit A, Bartlett, IL 60103
Contact Name: Michael Smith Phone: 630-550-5000

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

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
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 (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS 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 μ S/cm	0.44 μ S/cm	Ricca Chemical Conductivity Solutions DP-MET242
	447 μ S/cm	3 μ S/cm	
	1 413 μ S/cm	8.3 μ S/cm	
	8 974 μ S/cm	38 μ S/cm	
	12 880 μ S/cm	62 μ S/cm	

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
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 2500 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 μ m + 0.002 2L) μ m	Gage Blocks DP-MET268
Microscopes ^{FO}	0.000 5 in to 1 in	120 μ in	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) μ m	Master Steel Artifact DP-MET305
	Y Axis Up to 600 mm	(2.9 + 0.002 2L) μ m	
Field of View Measuring Systems (Oasis, Keyence) ^{FO}	Up to 1 in	36 μ in	Master Pin Gages DP-MET271
Bore Gages ^{FO}	0.236 2 in to 12 in	120 μ in	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 μ in	ULM DP-MET231
Gage Blocks ^F	0.05 in to 8 in	(2 + 3L) μ in	P&W Laseruler DP-MET232
Height Gages ^{FO}	0.05 in to 48 in	(540 + 20L) μ in	Gage Blocks DP-MET202
Calipers ^{FO}	Up to 12 in	(8.8 + 6.96L) μ in	Gage Blocks DP-MET219
	12 in to 60 in	(0 + 7.73L) μ in	
Form Roundness ^F	Up to 300 mm Diameter (Height Up to 500 mm)	(0.057 + 0.000 35H) μ m	Mitutoyo RA-2200AH Roundness Tester DP-MET306
Flatness ^F	Up to 300 mm Diameter	0.08 μ m	
Straightness ^F	Up to 350 mm Long	1.3 μ m	
Cylindricity ^F	Up to 300 mm Diameter (Height up to 500 mm)	0.41 μ m	
Indicators ^{FO}	0.000 1 in to 4 in (Resolution: 0.000 1 in)	(79 + 7.1L) μ in	Gage Blocks DP-MET217
	0.001 mm to 12.7 mm (Resolution: 1 μ m)	0.62 μ m	
	0.002 in (Resolution: 20 μ in)	15 μ in	
Outside Micrometers ^{FO}	0.05 in to 18 in	(24 + 6.7L) μ in	Gage Blocks Measuring Rods DP-MET218
	18 in to 48 in	(13 + 12.5L) μ in	
Depth Micrometers ^{FO}	0.05 in to 12 in	(96 + 8.4L) μ in	Gage Blocks DP-MET218A
Pin Gages ^{FO}	0.01 in to 1 in	(30 + 4.4D) μ in	Laser Micrometer DP-MET203
	0.01 in to 8 in	17 μ in + 6.23 μ in/in	ULM DP-MET203
Thread Measuring Wires ^F	0.004 in to 1 in	18 μ in	ULM DP-MET262
Thread Plug Gage Pitch Diameter ^{FO}	M 1.6 x 0.35 to M 100 x 6 0-80 to 4-10	(120 + 25.6D) μ in	Supermicrometer Thread Measuring Wires 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) μ in	Supermicrometer DP-MET214



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Thread Rings Pitch Diameter ^F	0.080 to 7 in	(35 μ in + 0.5L) μ in	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) μ in	Master Threaded Set Plug DP-MET248
Thread Rings Minor Diameter ^{FO}	M 1.6 x 0.35 to M 100 x 6 0-80 to 4-10	(57 + 18.8D) μ in	Master Plain Class X Set Plug DP-MET248
Radius Gages ^F	0.01 in to 1 in	(93 + 9.3R) μ in	Video Comparator DP-MET223
Squares ^F	1 in to 12 in	120 μ in	Video Comparator DP-MET227
Steel Rules ^F	3 in to 24 in	(90 + 16L) μ in	Video Comparator DP-MET210
Glass Scales, Stage Micrometer, Graduated Rules and Reticles ^F	Up to 24 in	(120 μ in + 23L) μ in	Video Comparator DP-MET210
Setting Masters, 1D ^F	0.015 in to 6 in	(92 + 16D) μ in	Video Comparator DP-MET106
Length Measurement Two dimensional gages.	Up to 38 in	(24 μ in + 2.1L) μ in	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	(0.00016 + 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 μ in	Repeat-O-Meter DP-MET220



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Coordinate Measuring Machines ^O Linear Accuracy	4 in to 20 in	(32 + 8.4L) μ in	Gage Blocks Ball Bar Checkmaster DP-MET285
	0.5 in to 40 in	60 μ in + 3.52 μ in/in	
Coordinate Measuring Machines Volumetric Accuracy ^O	4 in to 12 in	140 μ in	Setting Masters DP-MET104
	4 in to 20 in	160 μ in	
Hole Check, ID ^F	0.01 in to 0.33 in (Resolution: 0.000 1 in)	150 μ in	Surface Finish Analyzer DP-MET254
Chamfer Check, ID ^F	0.02 in to 4 in (Resolution: 0.000 1 in)	1 600 μ in	
Countersink, ID ^F	0.36 in to 0.78 in (Resolution: 0.000 1 in)	1 200 μ in	
Surface Roughness Specimen R _a ^{FO}	14 μ in to 500 μ in	3.6 μ in	Roughness Specimen DP-MET283
Profilometer ^{FO} Surface Roughness R _a	12 μ in to 120 μ in	3.5 μ in	Surface Plate with Levelers & Gage Blocks DP-MET204
Precision Levels ^F	2 in to 48 in	0.000 9° (170 μ in per foot)	P&W Laseruler DP-MET236
Precision Balls ^F	0.125 in to 4 in	(28 + 3.1D) μ in	Mahr PLM 600E Master Rings DP-MET229
Plain Rings ^F	Up to 17.5 in	(12 + 2.2D) μ in	ULM CMM DP-MET260
Length Standards ^F	1 in to 10 in	(23 + 13.8L) μ in	Master Gage Pins DP-MET296
	11 in to 36 in	(77 + 13.6L) μ in	
Laser Micrometer ^F	0.000 001 in to 1 in	42 μ in	Master Gage Blocks Master Load Cell DP-MET282
ULM / Bench Micrometer/ Super Micrometer ^F Linearty Force	0.000 001 in to 12 in Up to 2.5 lbf	(12 +2.7L) μ in 0.061 lbf	Master Gage Blocks DP-MET282
Mu-Checker / Amplifier ^F	0.000 01 in to 0.1 in	11 μ in	Master Gage Blocks DP-MET282



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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 μ V + 0.004 % of reading	Fluke 5522A DP-MET246
	330 mV to 3.3 V	5.5 μ V + 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	
Equipment to measure DC Current ^{FO}	0.25 mA to 330 mA	0.001 2 mA + 0.008 % of reading	
	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	



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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 k Ω	0.045 Ω + 0.006 % of reading	
	1.1 k Ω to 3.3 k Ω	0.011 k Ω + 0.008 % of reading	
	3.3 k Ω to 11 k Ω	0.001 2 k Ω + 0.003 % of reading	
	11 k Ω to 33 k Ω	0.012 k Ω + 0.008 % of reading	
	33 k Ω to 110 k Ω	0.012 k Ω + 0.006 % of reading	
	110 k Ω to 330 k Ω	1.2 k Ω + 0.001 % of reading	
	330 k Ω to 1 100 k Ω	0.046 k Ω + 0.009 % of reading	
	1.1 M Ω to 3.3 M Ω	0.000 8 M Ω + 0.036 % of reading	
	3.3 M Ω to 11 M Ω	0.001 M Ω + 0.033 % of reading	
	11 M Ω to 33 M Ω	0.095 M Ω + 0.2 % of reading	
33 M Ω to 110 M Ω	0.005 M Ω + 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 μ F to 11 μ F	5.2 nF + 0.3 % of reading	
	11 μ F to 330 μ F	70 nF + 0.9 % of reading	
	330 μ F to 1.1 mF	1.3 μ F + 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 μ V + 0.03 % of reading	
45 Hz to 10 kHz	330 mV to 3.3 V	53 μ V + 0.054 % of reading	
10 kHz to 20 kHz	330 mV to 3.3 V	122 μ V + 0.077 % of reading	
20 kHz to 50 kHz	330 mV to 3.3 V	164 μ V + 0.12 % of reading	
50 kHz to 100 kHz	330 mV to 3.3 V	38 μ V + 0.23 % of reading	
100 kHz to 500 kHz	330 mV to 3.3 V	120 μ V + 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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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 AC Current (at the listed frequencies) ^{FO}			Fluke 5522A DP-MET246
10 Hz to 20 Hz	33 μ A to 330 μ A	0.18 μ A + 0.13 % of reading	
20 Hz to 45 Hz	33 μ A to 330 μ A	0.24 μ A + 0.034 % of reading	
45 Hz to 1 kHz	33 μ A to 330 μ A	0.23 μ A + 0.066 % of reading	
1 kHz to 5 kHz	33 μ A to 330 μ A	0.17 μ A + 0.14 % of reading	
5 kHz to 10 kHz	33 μ A to 330 μ A	0.12 μ A + 0.73 % of reading	
Equipment to Measure AC Current (at the listed frequencies) ^{FO}			
10 Hz to 1 kHz	330 μ A to 3.3 mA	0.97 μ A + 0.044 % of reading	
1 kHz to 5 kHz	330 μ A to 3.3 mA	0.84 μ A + 0.1 % of reading	
5 kHz to 10 kHz	330 μ A to 3.3 mA	1 μ A + 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 μ V + 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 μ V + 0.081 % of reading	
1 kHz to 50 kHz	1 V to 10 V	0.06 μ V + 0.12 % of reading	
50 kHz to 300 kHz	1 V to 10 V	0.58 μ V + 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 μ V + 0.081 % of reading	
1 kHz to 50 kHz	10 V to 100 V	0.12 μ V + 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 μ A to 100 μ A	0.15 μ A	
	100 μ A to 10 mA	0.000 13 μ A + 0.15 % of reading	
	10 mA to 100 mA	0.000 21 μ A + 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 M Ω 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 M Ω Load	1 mV to 6.6 V _{p-p} (10 Hz to 1 kHz)	0.58 V + 0.281 % of reading	
	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 μ A to 1 mA	0.068 μ A	
	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 k Ω	0.006 9 Ω + 0.005 % of reading	
	1 k Ω to 10 k Ω	0.001 6 Ω + 0.005 2 % of reading	
	10 k Ω to 100 k Ω	0.005 3 % of reading	
	100 k Ω to 1 M Ω	0.009 1 % of reading	
	1 M Ω to 10 M Ω	0.003 5 % of reading	
	10 M Ω to 100 M Ω	0.003 8 % of reading	
Temperature Calibration Indication and Control Equipment used with Thermocouple Type B ^{FO}	600 $^{\circ}$ C to 1 820 $^{\circ}$ C	0.38 $^{\circ}$ 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}	0 $^{\circ}$ C to 2 316 $^{\circ}$ C	0.38 $^{\circ}$ C + 0.004 % of reading	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type E ^{FO}	-250 $^{\circ}$ C to 1 000 $^{\circ}$ C	0.38 $^{\circ}$ C + 0.004 % of reading	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J ^{FO}	-210 $^{\circ}$ C to 1 200 $^{\circ}$ C	0.38 $^{\circ}$ C + 0.004 % of reading	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K ^{FO}	-200 $^{\circ}$ C to 1 372 $^{\circ}$ C	0.38 $^{\circ}$ C + 0.004 % of reading	



Certificate of Accreditation: Supplement

Assurance Technologies, Inc.

1251 Humbrecht Circle, Unit A, Bartlett, IL 60103
 Contact Name: Michael Smith Phone: 630-550-5000

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

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
Temperature Calibration Indication and Control Equipment used with Thermocouple Type L ^{FO}	-200 °C to 900 °C	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 °C to 1 300 °C	0.38 °C + 0.004 % of reading	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type R ^{FO}	0 °C to 1 767 °C	0.38 °C + 0.004 % of reading	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type S ^{FO}	0 °C 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 °C to 600 °C	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 (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS 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 + 0.0148% 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 (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS 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 DP-MET215
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 (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS 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 x 10 ⁻² in/min	Digital Stopwatch Linear Scale DP-MET286
Tensile Crosshead Travel ^O	0.05 in to 24 in	0.007 in	Linear Scale DP-MET286
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 (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Pressure – Pnuematic ^{FO}	0.1 psi to 10 psi	0.06 psi + 1.23 % of reading	Pressure Calibrator DP-MET247
	10 to 100 psi	0.05 psi + 0.13 % of reading	
	100 to 1 000 psi	0.17 psi + 0.13 % of reading	
Pressure – Hydraulic ^{FO}	1 000 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 μ in --- ---	3 μ in 8.3 μ in 2.8 μ in 2.9 μ in	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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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
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	Stage Micrometer DP-MET256
	100 HK to 900 HK	17 HN	
Leebs-Hardness Testers Indirect Verification Vickers ^O	300 HLD to 900 HLD	12 HLD	Test Blocks DP-MET258



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Direct Verification of Durometer Hardness ^F Tester Types A, B, C, D, E, O, DO and IRHD Indenter Extension at Zero Reading	2.46 mm to 2.54 mm	3.5 μ m	DP-MET237 DP-MET288 Video Comparator 20x
Indenter Shape (Not all Parameters Apply to All of Durometer Types) Indenter Diameter Indenter Diameter IRHD Indenter Tip Diameter Indenter Tip Radius Indenter Tip Angle	--- --- --- --- ---	3.5 μ m 3.5 μ m 3.5 μ m 3.5 μ m 0.06°	Video Comparator 20x Video Comparator 20x Video Comparator 20x Video Comparator 20x Video Comparator 20x
Durometer Indenter Spring Types A, B, E & O Types C, D & DO Type IRHD M Types A, B, E & O IRHD N, H, L	4.4 N to 8.05 N 4.445 N to 44.45 N 0.001 gf to 31 gf 0.1 gf to 850 gf	1.4 N 1.4 N 0.033 gf 0.47 gf	Load Cell Load Cell DP-MET234 High Precision Gram Scale High Precision Gram Scale
Air Velocity Measuring Devices, Anemometers ^{FO}	400 to 3200 FPM	1.7 FMP + 0.018f) FPM	Master Anemometer Wind Tunnel DP-MET303



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Oven Calibration ^O	0 °C to 537.78 °C	0.97 °C	SAE AMS 2750D
Freezer ^O	Down to -80°C	0.084°C	DP-MET280
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 DP-MET245
	-30°C to 300°C	0.065 °C	Fluke 1552A Thermometer DP-MET245
IR Thermometer ^{FO}	0 °C to 572 °C	2.5 °C	Master IR Thermometer Blackbody DP-MET259
Relative Humidity Measuring Devices, Thermo-Hygrometers ^{FO}	10 % RH to 95 % RH	0.71 % RH	Thunder Scientific 2500ST-LT DP-MET302
Temperature Measuring Devices, Thermo-Hygrometers ^{FO}	-10 °C to 70 °C	0.1 °C	

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
Stopwatch / Timer ^F	15 s to 24 hr	0.14 s	NIST Synchronized Land Line DP-MET292
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 DP-MET295
Stroboscope ^F	300 rpm to 29 999 rpm	0.73 rpm + 0.002 13 % of reading	Comparison to Counter and Detector DP-MET295



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

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represent the smallest measurement uncertainties attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is 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 Measurement uncertainties achieved at customer sites can be expected to be larger than the measurement uncertainties obtained in the laboratory for similar calibrations. This is due to the effects of transportation of the standards and equipment and environmental effects which are typically not controlled as closely as at the laboratories fixed location.
3. The presence of a superscript ^F means that the laboratory performs calibration of the indicated parameter at its fixed location. Example: Outside Micrometer ^F would mean that the laboratory performs this calibration 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. Example: Outside Micrometer ^O would mean that the laboratory performs this calibration onsite at the customer's location.
5. The presence of a superscript ^{FO} means that the laboratory performs calibration of the indicated parameter at both its fixed location and onsite at customer locations. Example: Outside Micrometer ^{FO} would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.
6. 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 laboratory's fixed location.
7. The term D represents diameter in inches or millimeters as appropriate to the uncertainty statement.
8. The term R represents radius in inches or millimeters as appropriate to the uncertainty statement.
9. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.
10. 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.