Scope of Accreditation
For
Alliance Calibration

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In recognition of a successful assessment to ISO/IEC 17025:2005 to the following Calibration and Measurement Capabilities, accreditation has been granted to **Alliance Calibration** for the following:

Accreditation granted through: **September 15, 2017**

Calibration

Amount of Substance – pH/Conductivity

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
pH Meters	4 pH 7 pH 10 pH	0.022 pH 0.032 pH 0.040 pH	Compared to aqueous solutions
Conductivity Meters	1 µS 10 µS 100 µS 1 000 µS	0.35 µS/cm 0.50 µS/cm 4.1 µS/cm 26 µS/cm	

Acoustic, Ultrasound, and Vibration – Vibration

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Accelerometer Sensitivity (0 to 5 000) mV/g	10 to 99 Hz 100 Hz 101 to 920 Hz 921 to 5 000 Hz 5 001 to 10 000 Hz	1.7 % of reading 1.4 % of reading 1.6 % of reading 1.8 % of reading 2.3 % of reading	Master Accelerometer

Electrical – Capacitance

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Capacitance – Source	Up to 400 pF (0.4 to 1.1) nF @ 1 kHz	14 pF (0.11 + 0.007 4*x*) nF	Fluke 5500A

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Capacitance – Source	(1.1 to 3.3) nF @ 1 kHz (3.3 to 11) nF @ 1 kHz (11 to 33) nF @ 1 kHz (33 to 110) nF @ 1 kHz (110 to 330) nF @ 1 kHz (0.33 to 1.1) µF @ 100 Hz (1.1 to 3.3) µF @ 100 Hz (3.3 to 11) µF @ 100 Hz (11 to 33) µF @ 100 Hz (33 to 110) µF @ 50 Hz (110 to 330) µF @ 50 Hz (330 to 1 100) µF @ 50 Hz	(0.013 + 0.005 7*X*) nF (0.013 + 0.005 7*X*) nF (0.12 + 0.002 9*X*) nF (0.11 + 0.003 1*X*) nF (0.34 + 0.003 0*X*) nF (0.001 2 + 0.002 9*X*) µF (0.002 6 + 0.003 6*X*) µF (0.012 + 0.004 2*X*) µF (0.003 5 + 0.004 7*X*) µF (0.11 + 0.005 9*X*) µF (0.31 + 0.008 5*X*) µF (0.45 + 0.011*X*) µF	Fluke 5500A

Electrical – Current

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
DC Current – Measure	Up to 3A (3 to 10) A (10 to 200) A (200 to 500) A	(0.005 3 + 0.001 2*X*) mA 0.52 % of reading (1 + 0.021*X*) A (0.51 + 0.023*X*) A	Agilent 34401A Fluke 87 Fluke 336
DC Current – Source	Up to 3.3 mA (3.3 to 33) mA (33 to 330) mA (0.33 to 2.2) A (2.2 to 11) A (11 to 200) A (200 to 500) A	(0.000 086 + 0.000 14*X*) mA (0.000 32 + 0.000 12*X*) mA (0.002 9 + 0.000 12*X*) mA (0.000 051 + 0.000 35*X*) A (0.000 40 + 0.000 70*X*) A (0.11 + 0.002 2*X*) A (0.11 + 0.002 2*X*) A	Fluke 5500A w/ Coil
AC Current – Measure	40 Hz to 1 kHz 10 mA to 1 A (1 to 3) A (3 to 10) A (10 to 200) A (200 to 500) A	(0.000 69 + 0.001*X*) A 0.31 % of reading 0.52 % of reading (1 + 0.021*X*) A (0.64 + 0.023*X*) A	Agilent 34401A Fluke 336

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
AC Current – Source	Up to 0.33 mA (1 to 10) kHz	(0.000 62 + 0.000 9*X*) mA	Fluke 5500A
	(0.33 to 3.3) mA (1 to 10) kHz	(0.000 77 + 0.001*X*) mA	
	(3.3 to 33) mA (20 to 45) Hz	(0.012 + 0.000 94*X*) mA	
	45 Hz to 1 kHz	(0.0079 + 0.000 94*X*) mA	
	(1 to 5) kHz	(0.036 + 0.006 9*X*) mA	
	(5 to 10) kHz	(0.005 8 + 0.006 9*X*) mA	
	(33 to 330) mA (20 to 45) Hz	(0.043 + 0.001 1*X*) mA	Fluke 5500A w/ Coil
	45 Hz to 1 kHz	(0.04 + 0.001*X*) mA	
	(1 to 5) kHz	(0.036 + 0.002 3*X*) mA	
	(5 to 10) kHz	(0.035 + 0.006 9*X*) mA	
	(0.33 to 2.2) A (10 to 45) Hz	(0.000 36 + 0.002 3*X*) A	
	45 Hz to 1 kHz	(0.000 3 + 0.001 2*X*) A	
	(1 to 5) kHz	(0.000 35 + 0.008 7*X*) A	
	(2.2 to 11) A (45 to 65) Hz	(0.002 7 + 0.000 68*X*) A	
	(65 to 500) Hz	(0.002 4 + 0.001 2*X*) A	
	500 Hz to 1 kHz	(0.004 8 + 0.003 3*X*) A	
	(11 to 200) A (45 to 65) Hz	(0.22 + 0.001 7*X*) A	
	(200 to 500) A (45 to 65) Hz	(0.22 + 0.001 7*X*) A	

Electrical – Power

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
DC Power – Measure	Up to 33 W (33 to 330) W (330 to 11 000) W	(0.000 005 + 0.001*X*) W 0.1% of reading 0.1% of reading	Fluke 5500A
AC Power – Measure	(45 to 65) Hz Up to 33 W (33 to 330) W (330 to 11 000) W	(0.000 001 9 + 0.002 9*X*) W 0.17% of reading 0.17% of reading	

Electrical – Resistance

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Resistance – Measure	Up to 100 Ω (100 to 1 000) Ω (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	(0.004 7 + 0.000 088*X*) Ω (0.000 3 + 0.000 13*X*) Ω (0.000 015 + 0.000 12*X*) kΩ 0.012% of reading (0.000 001 9 + 0.000 1*X*) MΩ (0.03 + 0.009 1*X*) MΩ	Agilent 34401A
	(0 to 5 000) mΩ	(0.004 4 + 0.000 17*X*) mΩ	Agilent 34401A
Resistance – Source	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ (0.33 to 1.1) MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ	(0.007 0 + 0.000 17*X*) Ω (0.012 + 0.000 14*X*) Ω (0.012 + 0.000 1*X*) Ω (0.012 + 0.000 1*X*) Ω (0.000 069 + 0.000 1*X*) kΩ (0.000 076 + 0.000 11*X*) kΩ (0.000 7 + 0.000 1*X*) kΩ (0.000 62 + 0.000 12*X*) kΩ (0.008 4 + 0.000 12*X*) kΩ (0.006 9 + 0.000 14*X*) kΩ (0.000 064 + 0.000 17*X*) MΩ (0.000 079 + 0.000 17*X*) MΩ (0.000 64 + 0.000 69*X*) MΩ (0.000 64 + 0.001 2*X*) MΩ (0.006 4 + 0.005 8*X*) MΩ (0.01 + 0.005 9*X*) MΩ	Fluke 5500A
Resistance – Source	500 µΩ 5 mΩ 50 mΩ 500 mΩ 5 Ω	(0.001 3 + 0.005 8*X*) mΩ	Fluke 5500A Agilent 34401A Shunts
RTD Resistance Simulation Pt 385, 100 Ω	(-200 to 800) °C	(0.058) °C	Fluke 5500A

Electrical – Voltage

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
DC Voltage – Measure	Up to 1 V (1 to 10) V (10 to 100) V (100 to 1 000) V	(0.000 003 8 + 0.000 070*X*) V (0.000 010 + 0.000 046*X*) V 0.006 1 % of reading 0.006 6 % of reading	Agilent 34401A
	(1 to 80) kV	0.12 % of reading	Ross Engineering HV Probe
DC Voltage – Source	(0 to 330) mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (0.3 to 1) kV	(5.5 + 0.055*X*) µV (17 + 43.1*X*) µV (180 + 42.8*X*) µV (90 + 55.2*X*) µV (14 + 43.9*X*) µV	Fluke 5500A

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
AC Voltage – Measure	Up to 1 V 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	 (0.046 + 0.000 7*X*) mV (0.102 + 0.001 5*X*) mV (0.11 + 0.006 9*X*) mV (0.58 + 0.046*X*) mV	Agilent 34401A
	(1 to 750) V 10 Hz to 20 kHz (20 to 50) kHz	 (0.15 + 0.000 88*X*) V (0.021 + 0.002 1*X*) V	
	(1 to 40) kV @ 60 Hz	(0.000 5 + 1.3*X*) V/kV	Ross Engineering HV Probe
AC Voltage – Source	Up to 330 mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	 (0.058 + 0.002 9*X*) mV (0.05 + 0.000 48*X*) mV (0.049 + 0.001 1*X*) mV (0.052 + 0.001 8*X*) mV (0.11 + 0.003 1*X*) mV (0.23 + 0.008 7*X*) mV	Fluke 5500A
	(0.33 to 3.3) V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	 (0.000 3 + 0.001 73*X*) V (0.000 071 + 0.000 35*X*) V (0.000 02 + 0.000 9*X*) V (0.000 71 + 0.001 1*X*) V (0.002 + 0.002 8*X*) V (0.003 8 + 0.005 8*X*) V	Fluke 5500A
	(3.3 to 33) V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	 (0.002 9 + 0.001 7*X*) V (0.000 72 + 0.000 46*X*) V (0.003 + 0.000 92*X*) V (0.005 4 + 0.002 2*X*) V (0.02 + 0.002 8*X*) V	
	(33 to 330) V 40 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	 (0.007 9 + 0.000 58*X*) V (0.018 + 0.000 92*X*) V (0.038 + 0.001*X*) V	
AC Voltage – Source	(330 to 1 000) V 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 (0.09 + 0.000 6*X*) V (0.13 + 0.002 3*X*) V (0.58 + 0.002 3*X*) V	Fluke 5500A
Thermocouple Millivolt Simulation Type C	(0 to 1 000) °C (1 000 to 1 800) °C (1 800 to 2 316) °C	0.46 °C 0.54 °C 0.85 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C	0.51 °C 0.2 °C 0.18 °C 0.2 °C 0.24 °C	
Type J	(-210 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C	0.29 °C 0.18 °C 0.21 °C 0.29 °C	

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C	0.35 °C 0.22 °C 0.2 °C 0.29 °C 0.42 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1 300) °C	0.55 °C 0.26 °C 0.23 °C 0.22 °C 0.3 °C	
Type R	(0 to 250) °C (250 to 1 767) °C	0.62 °C 0.47 °C	
Type S	(0 to 250) °C (250 to 1 400) °C (1 400 to 1 767) °C	0.53 °C 0.44 °C 0.52 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.68 °C 0.27 °C 0.2 °C 0.18 °C	

Length – Artifacts and Standards 1D

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Gage Blocks	(0.005 to 1) in	(1.8 + 4.4*L*) µin	Gage Blocks, Gage Block Comparator
	2 in	9.8 µin	
	3 in	12 µin	
	4 in	15 µin	
	(5 to 20) in	(4 + 3.4*L*) µin	Universal Machine Gage Blocks
Plain Plug Gage	(0.007 to 10) in	(8.6 + 3.3*L*) µin	Universal Machine
Height/Step Master Height Master (Travel)	(0 to 24) in	(24 + 4.9*L*) µin	Gage Blocks, Surface Plate, Indicator
	(0 to 1) in	(34 + 2.6*L*) µin	
Micrometer Standard	(0.5 to 36) in	(0.087 + 5.3*L*) µin	Universal Machine
Plain Ring Gages	(0.15 to 10) in	(18 + 2.6*L*) µin	
Thread Wire [2]	(0.007 to 0.2) in	11 µin	Universal Machine XX Cylinder
Pin Gage	(0.011 to 2) in	(30 + 0.45*L*) µin	Super Micrometer
Thickness Gage (Leaf)	(0 to 1) in	(31 + 3*L*) µin	Super Micrometer
Tape Measures	Up to 50 ft	0.052 in	Master Tape
Steel Rules	Up to 72 in	(0.013 + 0.000 21*L*) in	Master Ruler

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Plastic Shim Stock [4]	(1 to 50) mils	(0.007 + 0.004 5*L*) mils	Bench Micrometer

Length – Artifacts and Standards 2D

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Thread Plug Gages Major Diameter	(0.06 to 8) in	(0.000 028 + 0.000 024*L*) in	Super Micrometer Thread Wires
Pitch Diameter (4 to 80) TPI		(82 + 1.7*L*) µin	
Thread Ring Gages Minor Diameter	(0.06 to 8) in	(351 + 11*L*) µin	Vision System Set Plugs Universal Machine
Pitch Diameter (4 to 80) TPI		(50 + 2.1*L*) µin	
Radius Gage	(0.015 6 to 2) in	(0.000 27 + 0.000 002 8*L*) in	Vision System
Spheres	(0.013 2 to 2) in	(12 + 2.7*L*) µin	Universal Machine
Squares	(2 to 18) in	(31 + 1.4*L*) µin	Grade AA Square Gage Blocks
Surface Plate [1]	(8 to 68) in diagonal	71 µin	Planekator
	(34 to 161) in diagonal	(34 + 7.1*L*) µin	Level System
Roughness Specimens	Up to 400 µin Ra	4.4 µin	Profilometers

Length – Artifacts and Standards 2D

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Gages and Fixtures, 2D Length	Up to 10 in	(220 + 6.6*L*) µin	Vision System
Gages and Fixtures, 2D Diameter	Up to 8 in	(210 + 16*L*) µin	Vision System
Gages and Fixtures, 2D Angle	(0 to 360) °	0.11°	Vision System

Length – Hand Tools and Precision Gages 1D

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Height Gage	(0 to 36) in	(95 + 1.3*L*) µin	Gage Blocks Surface Plate
Calipers	(0 to 60) in	(390 + 6*L*) µin	Gage Blocks
	(60 to 120) in	(320 + 6.5*L*) µin	

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Outside Micrometers	(0 to 36) in	(23 + 2.8*L*) µin	
Depth Micrometers	(0 to 12) in	(596 + 0.11*L*) µin	Gage Blocks Surface Plate
Inside Micrometer	(0.1 to 36) in	(569 + 1.3*L*) µin	
Bore Micrometers	(0.15 to 10) in	(26 + 42*L*) µin	Ring Gages
Bench Micrometer Travel Anvil Flatness Anvil Parallelism	(0 to 1) in	 14 µin 6.2 µin 8.6 µin	Gage Blocks Optical Flat Sphere
Indicator 0.001 in resolution 0.000 5 in resolution 0.000 1 in resolution 0.000 05 in resolution 0.000 01 in resolution	(0 to 4) in	 (580 + 0.06*L*) µin (290 + 0.12*L*) µin (58 + 0.59*L*) µin (29 + 1.1*L*) µin (5.2 + 3.6*L*) µin	Indicator Tester Gage Blocks
Universal Measuring Machine	(0 to 24) in	(2.6 + 3.9*L*) µin	Gage Blocks
Ultrasonic Thickness Gages	(0.005 to 2) in	580 µin	Gage Blocks
Magnetic Coating Thickness Gages [4]	(1 to 50) mils	(0.023 + 0.005*L*) µin	Precision Shims Bench Micrometer

Length – Hand Tools and Precision Gages 2D

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Profilometer (Ra)	(0 to 200) µin	3.2 µin	Roughness Standard ASME B46.1-2009
Protractor	(0 to 90) °	0.14 °	Granite Squares
Optical Comparators			Glass Scale Length Standards Spheres
Magnification	5x to 100x	(610 + 1.2*L*) µin	
Linearity	(0 to 6) in	(140 + 0.67*L*) µin	
Squareness	(0 to 6) in	93 µin	
Microscopes Stage Travel	(0 to 1) in	(54 + 45*L*) µin	Gage Blocks

Length – Hand Tools and Precision Gages 3D

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
CMM Linearity	Up to 48 in	(14 + 5.3*L*) µin	Step Gage and Gage Blocks in accordance with B89.4.10360-2
CMM Repeatability		87 µin	

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
CMM Volumetric Accuracy	Up to 48 in	96 µin	Ball Bar in accordance with B89.4.1-1997

Mass – Flow

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Gas Flow Speed (Anemometers)	492 ft/min 984 ft/min 1 969 ft/min 2 953 ft/min	1.9 ft/min + 3.8 % of reading	TSI 9535 VelociCalc
Gas Flow Meter	(50 to 500) CCM Up to 50 SLM (50 to 250) SLM	1.2 CCM + 0.5 % of reading 0.12 SLM + 0.5 % of reading 1.2 SLM + 0.8 % of reading	Alicat Flow Standard
Liquid Flow (gravimetric)	(0.3 to 50) gpm	0.008gpm + 1.4 % of reading	Scale

Mass – Force

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Bench Micrometer Measuring Force	(4 to 40) ozf	2.1 ozf	Force Gage
Force Gages	1 grf to 45 kgf	(5.7 + 1.1*F*) gf	Class F Masses
	(0.5 to 50) lbf (50 to 250) lbf	(0.003 4 + 0.000 3*W*) lbf (0.009 7 + 0.000 2*W*) lbf	Class 7 Masses
Load Cells	(10 to 500) lbf (501 to 1 000) lbf (1 001 to 5 000) Lbf (5 001 to 20 000) lbf	0.83 lbf + 0.1% of reading 1.1 lbf + 0.051% of reading 5.9 lbf + 0.032% of reading 58 lbf + 0.003% of reading	Load Cells

Mass – Hardness

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers	HRBw Low Middle High	 4.6 HRBw 2.2 HRBw 2.5 HRBw	Indirect Verification per ASTM E18
	HRC Low Middle High	 2 HRC 1.9 HRC 1.1 HRC	

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers	HRFw Low Middle High	 1.9 HRFw 1.1 HRFw 1.4 HRFw	Indirect Verification per ASTM E18
	HR15N Low Middle High	 1.7 HR15N 2.2 HR15N 1.3 HR15N	
	HR30N Low Middle High	 2 HR30N 2 HR30N 1.5 HR30N	
	HR45N Low Middle High	 1.8 HR45N 2.1 HR45N 1.4 HR45N	
	HR15Tw Low Middle High	 3 HR15Tw 1.5 HR15Tw 1.5 HR15Tw	
	HR30Tw Low Middle High	 4.1 HR30Tw 1.9 HR30Tw 1.8 HR30Tw	
	HR45Tw Low Middle High	 2 HR45Tw 1.6 HR45Tw 2 HR45Tw	

Mass – Masses

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Masses	1g 2g 5g 10g 20g 50g 100g 200g	0.13 mg 0.22 mg 0.19 mg 0.22 mg 0.25 mg 0.49 mg 0.77 mg 1.3 mg	Class 1 Masses

Mass – Pressure / Low Vacuum

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Pressure Gage	(0 to 30) psig	0.009 psig + 0.005 % of reading	Druck DPI 802-Pneumatic
	(10 001 to 14 500) psig	17 psig + 0.007 % of reading	Keller Gage-Hydraulic

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Vacuum Gage	(-14.5 to 0) psig	0.026 psig	Druck DPI 802-Pneumatic
Pressure Devices	(2 to 500) psig	0.000 51 psig + 0.037 % of reading	Dead Weight Tester-Hydraulic
	(500 to 10 000) psig	0.7 psig + 0.033 % of reading	

Mass – Scales and Balances

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Precision Scales & Balances (0.000 01 g Resolution)	(0 to 100) g	0.29 mg	Class 1 Masses
(0.000 01 g Resolution)	(0 to 200) g	0.64 mg	
(0.000 1 g Resolution)	(0 to 100) g	0.3 mg	
(0.000 1 g Resolution)	(0 to 210) g	0.64 mg	
(0.000 1 g Resolution)	(0 to 400) g	1.2 mg	
(0.001 g Resolution)	(0 to 100) g	0.65 mg	
(0.002 g Resolution)	(0 to 200) g	1.3 mg	
(0.005 g Resolution)	(0 to 500) g	10 mg	Class F Masses
(0.01 g Resolution)	(0 to 1 000) g	0.16 g	
(0.02 g Resolution)	(0 to 2 000) g	0.2 g	
(0.05 g Resolution)	(0 to 5 000) g	0.58 g	
(0.1 g Resolution)	(0 to 10 000) g	1.2g	
(0.2 g Resolution)	(0 to 20 000) g	2.3g	
(0.5 g Resolution)	(0 to 38 000) g	2.7 g	
(0.000 2 lb Resolution)	(0 to 2) lb	0.000 77 lb	Class 7 Weights
(0.000 5 lb Resolution)	(0 to 5) lb	0.001 9 lb	
(0.001 lb Resolution)	(0 to 10) lb	0.002 6 lb	
(0.002 lb Resolution)	(0 to 20) lb	0.003 7 lb	
(0.005 lb Resolution)	(0 to 50) lb	0.01 lb	
(0.01 lb Resolution)	(0 to 100) lb	0.019 lb	
(0.02 lb Resolution)	(0 to 200) lb	0.027 lb	

Mass – Torque

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Torque Tools	(0.5 to 400) ozf·in (4 to 50) lbf·in (10 to 150) lbf·in (30 to 400) lbf·in (80 to 1 000) lbf·in (10 to 125) lbf·ft (60 to 600) lbf·ft (100 to 1 000) lbf·ft (1 000 to 2 000) lbf·ft	0.33 % of reading 0.38 % of reading 0.33 % of reading 0.33 % of reading 0.33 % of reading 0.6 % of reading 0.71 % of reading 0.9 % of reading 18 lbf·ft + 0.13 % of reading	CDI Torque Tester
Torque Transducers	Up to 1 000 lbf·ft	0.11 % of reading	Torque Arms & Class F Weights

Mass – Volume

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Pipettes	(10 to 1 000) µL	0.28 µL + 0.06 % of reading	Gravimetric

Thermodynamics – Humidity

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Relative Humidity	(0 to 80) % RH	(1.2 + 0.005 4*T*) % RH	Vasaila MI70 / HMP77

Thermodynamics – Thermometers and Probes

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Temperature Probes and Systems	(-30 to 660) °C	0.073 °C	Hart Scientific Baths and Drywells and 5609 PRT
Liquid in Glass Thermometers	(-30 to 120) °C	0.12 °C	Hart Scientific Bath and 5609 PRT

Thermodynamics – Temperature Sources

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Temperature Measure	(-195 to 420) °C (420 to 660) °C	0.069 °C 0.38 °C	5609 PRT

Time and Frequency – Frequency / Period

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-) [3]	Remarks
Frequency – Source	(0.000 001 to 50) MHz (50 to 600) MHz 10 MHz	0.001 8 Hz + 0.000 12% of reading 0.000 18 Hz + 0.000 81% of reading 0.002 Hz	Fluke 5500A
Frequency – Measure	1 Hz to 225 MHz 225 MHz to 3 GHz	(0.008 1 + 0.000 000 000 4*X*) Hz (0.011+ 0.000 000 000 15*X*) Hz	HP 53132 Counter
Timers and Stopwatches	(0.1 to 10) min	0.034 sec + 0.005 9% of reading	HP 53132 Counter

Time and Frequency – Oscilloscopes

Calibration Parameter/Equipment [1]	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Time Base	(2 to 10) nS 20 ns to 1 µS (2 to 50) µS (0.1 to 5 000) mS	0.003 pS 0.003 nS (0.039 nS + 0.000 2% of reading (0.2 mS + 0.2% of reading	Fluke 5500A
Bandwidth	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	4.3% of reading 4.9% of reading 7.3% of reading	
Amplitude	(0 to 5) V pp	0.35 mV + 2.3% of reading	

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and remarks. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 (k=2), corresponding to a confidence level of approximately 95%.

Notes:

1) Laboratory offers calibration services at the laboratory's own facilities and at the client or other agreed upon facilities.
2) Uncertainty shown is per wire for thread wire sets.
3) *L* = length in inches, *D* = diameters in inches, *T* = temperature / RH applied, *X* = flow / frequency / volts / ohms / amps / capacitance applied, *M* = mass applied, *F* = force in kg, *P* = pressure applied, *V* = volume, *W* = weight in lb
4) 1 mil = 0.001 in

Approved by: _____ Date: September 21, 2016

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