Scope of Accreditation
For
The Calibration Solution Inc.

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In recognition of a successful assessment to ISO/IEC 17025:2005, accreditation is granted to **The Calibration Solution Inc.** to perform the following Calibrations:

Accreditation granted through: **October 26, 2012**

Calibration

Length - Dimensional Metrology – Hand Tools and Precision Gages 1D

Calibration Parameter/Equipment	Range	Best Measurement Capability (+/-) [2, 3]	Remarks
Bench Micrometer [1]	0 in to 2 in	(47 + 11*L*) µin	Gage Blocks
Calipers [1]	0 in to 24 in	(360 + 11*L*) µin	Gage Blocks/Ring Gage
	24 in to 72 in	(330 + 16*L*) µin	
Dial Bore Gage [1]	1 in to 10 in	41 µin	Supermic
Dial Indicator Calibrator	0 in to 1 in	(16 + 1*L*) µin	Gage Blocks/Elec Amp
Dial/Test/Elect Indicators [1]	0 in to 4 in	(64 + 3*L*) µin	Gage Blocks
Electronic Amp	0 in to 0.2 in	14 µin	Gage Blocks
	0 in to 0.2 in	(9.9 + 3.5*L*) µin	Zeiss ULM
Height Gage [1]	0 in to 48 in	(45 + 6*L*) µin	Gage Blocks
Height Master [1]	0 in to 48 in	(42 + 3*L*) µin	Gage Blocks/Elec Amp
Intramic/Bore Mic	0.2 to 6 in	(150 + 27*D*) µin	Ring Gages
High Precision Indicators	0.002 in	4 µin	Grade 1 Gage Blocks
Micrometer, ID	0 in to 12 in	(37 + 3*L*) µin	Supermic
	12 in to 60 in	(42 + 3*L*) µin	Gage Blocks/Elect Amp
Micrometer, OD [1]	0 in to 72 in	(47 + 11*L*) µin	Gage Blocks
Micrometer, Depth [1]	0 in to 24 in	(110 + 8*L*) µin	Gage Blocks
Micrometer Head	0 in to 2 in	24 µin	Zeiss ULM
Supermic, OD [1]	0 in to 18 in	17 µin	Gage Blocks

Length - Dimensional Metrology – Hand Tools and Precision Gages 2D

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2, 3]	Remarks
Bench Centers [1]	0 in to 48 in	140 µin	Arbor/Elec Amp
Dial Sink/ Counter bore Gage	0 in to 1 in	130 µin	Ring Gage
Levels	14 in	280 µin	Surface Plate
Optical Comparator [1] Linear	0 in to 6 in	(370+62*L*) µin	Glass Scale
Optical Comparator [1] Angular	0 ° to 360 °	0.02 °	

Length - Dimensional Metrology – Artifacts and Standards 1D

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2, 3]	Remarks
Caliper Checker	0 in to 72 in	(42 + 3*L*) µin	Gage Blocks/Elec Amp
Geometric References Flatness, Parallelism, Straightness	1 in to 24 in	58 µin	Surface plate/Electronic Amp
	24 in to 60 in	95 µin	
Gage Blocks, Steel	0.01 in to 4 in	(4 + 2.2*L*) µin	Gage Block Comparator
	5 in to 20 in	(0.9+2.5*L*) µin	Johansson Comparator & Surface Plate
Gage Blocks, TC/CC/Ceramic	0.01 in to 4 in	(3.8 + 4.2*L*) µin	Gage Block Comparator
Gage Block Comparator	0.01 in	2.3 µin	Gage Blocks
Kalmaster	0 in to 18 in	(42 + 3*L*) µin	Gage Blocks/Electronic Amp
Length Standards [1]	0 in to 72 in	(42 + 3*L*) µin	Gage Blocks/Elec Amp
Micrometer Master, Depth	0 in to 12 in	(42 + 3*L*) µin	Gage Blocks/Elec Amp
Micrometer Master, OD	0 in to 12 in	(42 + 3*L*) µin	Gage Blocks/Elec Amp
Optical Flats and Parallels Flatness	1 to 6 in diameter	3 µin	Master Optical Flat
Optical Flats and Parallels Parallelism	Up to 1 in	3 µin	Gage Block Comparator
Parallels	0 in to 24 in	58 µin	Elec Amp/Surface Plate
	24 to 60 in	95 µin	
Pitch Gage	1 tpi to 100 tpi	(600 + 8*L*) µin	Optical Comparator
Plain Plug Gage [1]	0 in to 14 in	(22 + 2*D*) µin	Labmaster Universal
Plain Ring Gage [1]	0.05 in to 0.4 in	8 µin	Labmaster Universal
	0.4 in to 14 in	(8 + 3*D*) µin	
Sine Plates/Bars Flatness Angle Roll Distance	5 in to 20 in	58 µin	Elec Amp, Surface Plate, Gage Blocks

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2, 3]	Remarks
Steel Ball (size only)	0.05 to 1 in	(37 + 3*D*) µin	Supermic/Gage Blocks
Steel Rule[1]	1 in to 96 in	(5700 + 2*L*) µin	Gage Blocks
Straight Edge	1 in to 24 in	58 µin	Elec Amp/Surface Plate
	24 in to 60 in	95 µin	
Thickness/Feeler/Pin Gages[1]	0.001 in to 1 in	(37 + 3*D*) µin	Supermic
Thread Measuring Wires	0 in to 0.25 in	30 µin	Supermic
Surface Plates Repeatability Flatness	 0.002 in 24 to 144 in	 (32 + 0.1*L*) µin (51 + 4*L*) µin	 Repeat Reading Gage Autocollimator

Length - Dimensional Metrology – Artifacts and Standards 2D

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2, 3]	Remarks
1-2-3 Blocks	Up to 3 in	(42 + 3*L*) µin	Elec Amp/Gage Blocks
Angle Gage Blocks	0 ° to 45 °	6.3 “	Sine Bar/ Elec Amp
Arbors	0 in to 14 in	58 µin	Supermic/Bench Center/Amp
Fixtures/Functional Gages	0 to 6 in	(600 + 8*L*) µin	30” Optical Comparator
	0 to 360 °	0.065 °	
Protractor[1]	0 ° to 360 °	0.07 °	Optical Comparator
	0 ° to 45 °	6.3 “	Sine Bar/Gage Blocks
Radius Gage	0.0156 in to 2 in	(600 + 8*D*) µin	Optical Comparator
Sine Plates/Bars Flatness Angle Roll Distance	5 to 20 inch	58 µin	Elec Amp, Surface Plate, Gage Blocks
Squares[1]	1 in to 24 in	(24 + 2.2*L*) µin	Granite Square/Elec Amp
V Blocks Parallelism V-Centrality Perpendicularity	Up to 12 in[3]	150 µin	Elec Amp, Arbor, Surface Plate, Square

Length - Dimensional Metrology – Artifacts and Standards 3D

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Fixtures/Functional Gages	X Axis 28 in	400 µin	CMM incorporated in measurement process
	Y Axis 28 in	400 µin	
	Z Axis 24 in	400 µin	
Plain Taper Arbor	0 in to 20 in	400 µin	CMM

Length - Dimensional Metrology – Other

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2, 3]	Remarks
NPT Thread Ring	0.0625 in to 2.5 in	(190 + 1*D*) µin	NPT Plugs
NPTF Taper Plugs	0.0625 in to 6 in	(56 + 2*D*) µin	Supermic/Sine Block
Profilometer[1]	12 to 120 Ra µin	(3 + 0.02*H*)Ra µin	3 Patch Surface Finish Standard
Surface Finish Standard[1]	12 to 1000 Ra µin	(3.5 + 0.03*L*) Ra µin	Profilometer
Thread Plugs [1]	0 in to 14 in 6 tpi to 80 tpi	(130 + 2*PD*) µin	Supermic/Thread Wires
Thread Plug Gage, tapered	0.125 in to 6 in	(140 + 2*D*) µin	Supermic/Thread Wires/Sine Block
Thread Ring Gage [1]	0.1 in to 1.5 in 6 tpi to 80 tpi	(190 + 1*PD*) µin	Set Plugs
	0.2 in to 5 in 6 tpi to 64 tpi	(200 + 1*PD*) µin	Zeiss ULM

Length – Laser Frequency – Dimensional Equipment

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2, 3]	Remarks
Laser Micrometer [1]	0 in to 1 in	(36 + 14*L*) µin	Master Pins

Mass – Scale and Balances

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Weighing Systems [1] (1 g resolution)	1 g to 6000 g	1.2 g	ASTM E617 Class 6 weights and NIST Handbook 44 utilized for the calibration of the weighing system.
Weighing Systems [1] (0.001 lb resolution)	0.1 lb to 12 lb	0.0015 lb	
Weighing Systems [1] (0.01 lb resolution)	1 lb to 220 lb	0.013 lb	NIST Class F weights and NIST Handbook 44 utilized for the calibration of the weighing system.
Weighing Systems [1] (0.1 lb resolution)	1 lb to 220 lb	0.13 lb	
Weighing Systems [1] (1 lb resolution)	1 lb to 220 lb	1.3 lb	
Weighing Systems [1] (2 lb resolution)	2 lb to 220 lb	2.6 lb	

Mass – Pressure

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Pressure [1]	5 psi to 10 000 psi	0.14% applied load	Deadweight Tester
Pressure [1]	0 to 300 psi	0.17 psi	Pneumatic Pressure Calibrator

Mass – Vacuum

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Pressure [1]	-12.3 to 0 psi	0.17 psi	Pneumatic Pressure Calibrator

Mass – Torque

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Torque Tools[1]	0.4 lbf·ft to 1000 lbf·ft	0.4 % applied load	CDI Torque Tester
Torque Watch	1 ozf·in to 80 ozf·in	0.11ozf·in + 0.0024 ozf·in/ozf·in	CDI Torque Tester
Torque Transducer/Calibrator	0.005 lbf·ft to 2000 lbf·ft	0.1% applied load	Torque Wheels and Class F Weights

Mass – Force

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Durometers	Type A	1.3 Duro	Comparison to scale
	Type D	1.4 Duro	

Mass – Hardness

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Microhardness, Knoop [1]	500 g load	18 HK	ASTM E-384 Indirect comparison
Vickers [1]		19 HV	
Brinell Hardness Testers [1]	3000 kgf load Low Middle High	 7.4HB 6.4HB 6.4HB	ASTM-E-10 Indirect Verification
	1500 kgf load Low Middle High	 4.7HB 5.3HB 5.4HB	
	500 kgf load Low Middle High	 4.5HB 4.9HB 5.3HB	

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Rockwell Hardness Testers [1]	HRC Low Middle High	 0.74 HRC 0.53 HRC 0.47 HRC	ASTM-E-18 Indirect Verification
	HRB Low Middle High	 1.1 HRB 0.94 HRB 0.71 HRB	
	HRA Low Middle High	 0.71 HRA 0.56 HRA 0.47 HRA	
	HR45T Low Middle High	 0.64 HR45T 0.87 HR45T 0.7 HR45T	
	HR30T Low Middle High	 0.9 HR30T 1 HR30T 0.86 HR30T	
	HR15T Low Middle High	 1 HR15T 1 HR15T 0.8 HR15T	
Rockwell Hardness Testers [1]	HR45N Low Middle High	 0.79 HR45N 0.76 HR45N 0.8 HR45N	ASTM-E-18 Indirect Verification
	HR30N Low Middle High	 0.85 HR30N 0.9 HR30N 0.79 HR30N	
	HR15N Low Middle High	 0.73 HR15N 0.84 HR15N 0.74 HR15N	

Electricity and Magnetism – Voltage

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
DC Volts, Source	0 mV to 330 mV	0.018 µV/mV + 2.4 µV	Fluke 5520A/SC1100
	0.3 V to 3.3 V	11 µV/V + 7.2 µV	
	3.3 V to 33 V	13 µV/V + 15 µV	
	33 V to 330 V	18 µV/V + 310 µV	
	330 V to 1 000 V	19 µV/V + 1.4 mV	
AC Volts, Source (1 to 33) mV	10 Hz to 45 Hz	8 µV/mV + 61 µV	Fluke 5520A/SC1100
	45 Hz to 10 kHz	0.17 µV/mV + 37 µV	
	10 kHz to 20 kHz	0.28 µV/mV + 37 µV	
	20 kHz to 50 kHz	1 µV/mV + 36 µV	
	50 kHz to 100 kHz	3.4 µV/mV + 33 µV	
	100 kHz to 500 kHz	0.88 µV/mV + 37 µV	
AC Volts, Source (33 to 330) mV	10 Hz to 45 Hz	0.65 µV/mV + 51 µV	Fluke 5520A/SC1100
	45 Hz to 10 kHz	0.19 µV/mV + 37 µV	
	10 kHz to 20 kHz	0.29 µV/mV + 38 µV	
	20 kHz to 50 kHz	0.7 µV/mV + 38 µV	
	50 kHz to 100 kHz	1.1 µV/mV + 50 µV	
	100 kHz to 500 kHz	2.1 µV/mV + 92 µV	
AC Volts, Source (0.33 to 3.3) V	10 Hz to 45 Hz	640 µV/V + 0.26 mV	Fluke 5520A/SC1100
	45 Hz to 10 kHz	205 µV/V + 0.1 mV	
	10 kHz to 20 kHz	310 µV/V + 110 µV	
	20 kHz to 50 kHz	0.68 mV/V + 0.1 mV	
	50 kHz to 100 kHz	1.1 mV/V + 0.17 mV	
	100 kHz to 500 kHz	2.5 mV/V + 0.78 mV	
AC Volts, Source (3.3 to 33) V	10 Hz to 45 Hz	0.64 mV/V + 2.7 mV	Fluke 5520A/SC1100
	45 Hz to 10 kHz	0.21 mV/V + 1.1 mV	
	10 kHz to 20 kHz	0.4 mV/V + 1.1 mV	
	20 kHz to 50 kHz	0.89 mV/V + 1.1 mV	
	50 kHz to 100 kHz	2.2 mV/V + 1.6 mV	
AC Volts, Source (33 to 330) V	45 Hz to 1 kHz	0.64 mV/V + 5.4 mV	Fluke 5520A/SC1100
	1 kHz to 10 kHz	0.28 mV/V + 8.8 mV	
	10 kHz to 20 kHz	2.5 mV/V + 5 mV	
	20 kHz to 50 kHz	2.5 mV/V + 7.2 mV	
	50 kHz to 100 kHz	4.5 mV/V + 48 mV	

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
AC Volts, Source (330 to 1 000) V	45 Hz to 1 kHz	0.68 mV/V + 18 mV	Fluke 5520A/SC1100
	1 kHz to 5 kHz	0.38 mV/V + 19 mV	
	5 kHz to 10 kHz	0.41 mV/V + 19 mV	
DC Voltage, Measure	0 mV to 100 mV	0.0035 µV/mV + 2.1 µV	Agilent 3458A System Multimeter
	0.1 V to 1 V	7 µV/V + 1.8 µV	
	1 V to 10 V	7.8 µV/V + 2.7 µV	
	10 V to 100 V	9.7 µV/V + 72 µV	
	100V to 1 000 V	22 µV/V + 240 µV	
	1 000V to 6 000 V	0.0091 V/V + 5.4 V	Greenlee 4.5 digit DMM and Fluke 80k-6 HV Probe
AC Voltage, Measure (1 to 100) mV	1 Hz to 40 Hz	0.066 µV/mV + 4.9 µV	Agilent 3458A System Multimeter
	40 Hz to 1 kHz	0.059 µV/mV + 4 µV	
	1 kHz to 20 kHz	0.13 µV/mV + 3.4 µV	
	20 kHz to 50 kHz	0.29 µV/mV + 3.3 µV	
	50 kHz to 100 kHz	0.77 µV/mV + 6.7 µV	
	100 kHz to 300 kHz	3.0 µV/mV + 12 µV	
	300 kHz to 1 MHz	20 µV/mV + 64 µV	
	1 MHz to 4 MHz	40 µV/mV + 77 µV	
	4 MHz to 8 MHz	40 µV/mV + 87 µV	
	8 MHz to 10 MHz	150 µV/mV + 100 µV	
AC Voltage, Measure (0.1 to 1) V	1 Hz to 40 Hz	68 µV/V + 44 µV	Agilent 3458A System Multimeter
	40 Hz to 1 kHz	68 µV/V + 23 µV	
	1 kHz to 20 kHz	140 µV/V + 21 µV	
	20 kHz to 50 kHz	300 µV/V + 24 µV	
	50 kHz to 100 kHz	800 µV/V + 20 µV	
	100 kHz to 300 kHz	3 mV/V + 0.1 mV	
	300 kHz to 1 MHz	20 mV/V + 0.5 mV	
	1 MHz to 4 MHz	40 mV/V + 0.7 V	
	4 MHz to 8 MHz	40 mV/V + 0.8 mV	
	8 MHz to 10 MHz	150 mV/V + 1 mV	

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
AC Voltage, Measure (1 to 10) V	1 Hz to 40 Hz	62 μV/V + 560 μV	Agilent 3458A System Multimeter
	40 Hz to 1 kHz	69 μV/V + 210 μV	
	1 kHz to 20 kHz	140 μV/V + 210 μV	
	20 kHz to 50 kHz	300 μV/V + 210 μV	
	50 kHz to 100 kHz	800 μV/V + 210 μV	
	100 kHz to 300 kHz	3.0 mV/V + 1 mV	
	300 kHz to 1 MHz	20 mV/V + 5 mV	
	1 MHz to 4 MHz	40m V/V + 7 mV	
	4 MHz to 8 MHz	40 mV/V + 8 mV	
	8 MHz to 10 MHz	150 mV/V + 10 mV	
AC Voltage, Measure (10 to 100) V	1 Hz to 40 Hz	0.2 mV/V + 4.3 mV	Agilent 3458A System Multimeter
	40 Hz to 1 kHz	0.2 mV/V + 2.2 mV	
	1 kHz to 20 kHz	0.2 mV/V + 2.1 mV	
	20 kHz to 50 kHz	0.34 mV/V + 2.9 mV	
	50 kHz to 100 kHz	1.2 mV/V + 2.1 mV	
	100 kHz to 300 kHz	4 mV/V + 10 mV	
	300 kHz to 1 MHz	15 mV/V + 10 mV	
AC Voltage, Measure (100 to 1 000) V	1 Hz to 40 Hz	0.4 mV/V + 41 mV	Agilent 3458A System Multimeter
	40 Hz to 1 kHz	0.4 mV/V + 22 mV	
	1 kHz to 20 kHz	0.6 mV/V + 21 mV	
	20 kHz to 50 kHz	1.2 mV/V + 21 mV	
	50 kHz to 100 kHz	3 mV/V + 20 mV	
AC Voltage, Measure (1 000 to 3 000) V	45 Hz to 500 Hz	0.02 V/V + 0.29 V	Greenlee 4.5 digit DMM and Fluke 80k-6 HV Probe

Electricity and Magnetism – Resistance

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
Resistance, Source	0 Ω to 11 Ω	9.1 μΩ/Ω + 990 μΩ	Fluke 5520A/SC1100
	11 Ω to 33 Ω	16 μΩ/Ω + 1.4 mΩ	
	33 Ω to 110 Ω	21 μΩ/Ω + 1.1 mΩ	
	110 Ω to 330 Ω	25 μΩ/Ω + 1.2 mΩ	
	330 Ω to 1 100 Ω	27 μΩ/Ω + 0.0017 Ω	

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
	1.1 kΩ to 3.3 kΩ	23 μΩ/Ω + 0.024 Ω	
	3.3 kΩ to 11 kΩ	25 μΩ/Ω + 0.05 Ω	
	11 kΩ to 33 kΩ	23 μΩ/Ω + 0.24 Ω	
	33 kΩ to 110 kΩ	25 μΩ/Ω + 0.5 Ω	
	110 kΩ to 330 kΩ	29 μΩ/Ω + 1.3 Ω	
	0.33 MΩ to 1.1 MΩ	32 μΩ/Ω + 1.9 Ω	
	1.1 MΩ to 3.3 MΩ	77 μΩ/Ω + 1.3 Ω	
	3.3 MΩ to 11 MΩ	140 μΩ/Ω + 4.4 Ω	
	11 MΩ to 33 MΩ	260 μΩ/Ω + 1.3 kΩ	
	33 MΩ to 110 MΩ	530 μΩ/Ω + 760 Ω	
	110 MΩ to 330 MΩ	3.1 mΩ/Ω + 3.7 kΩ	
	330 MΩ to 1 100 MΩ	15 mΩ/Ω + 1.9 kΩ	
Resistance, Measure	0 Ω to 10 Ω	13 μΩ/Ω + 79 μΩ	Agilent 3458A System Multimeter
	10 Ω to 100 Ω	11 μΩ/Ω + 700 μΩ	
	100 Ω to 1 kΩ	0.01 mΩ/Ω + 0.95 mΩ	
	1k Ω to 10 kΩ	0.01 mΩ/Ω + 9.6 mΩ	
	10 kΩ to 100 kΩ	0.01 mΩ/Ω + 130 mΩ	
	100 kΩ to 1 MΩ	15 Ω/MΩ + 3.6 Ω	
	1M Ω to 10 MΩ	79 Ω/MΩ + 75 Ω	
	10M Ω to 100 MΩ	0.50 kΩ/MΩ + 1.5 kΩ	
	100M Ω to 1 000 MΩ	5 kΩ/MΩ + 14 kΩ	

Electricity and Magnetism – Current

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
DC Current, Source	0 μA to 330 μA	0.15 nA/μA + 20 nA	Fluke 5520A/SC1100
	0.3 mA to 3.3 mA	99 nA/μA + 54 nA	
	3.3 mA to 33 mA	99 nA/μA + 290 nA	
	33 mA to 330 mA	0.099 μA/mA + 2.9 μA	
	0.33 A to 1.1 A	200 μA/A + 44 μA	
	1.1 A to 3 A	380 μA/A + 45 μA	Fluke 5520A/SC1100
	3.0 A to 11 A	490 μA/A + 620 μA	
	11 A to 20 A	0.99 mA/A + 1 mA	
	50 A to 150 A	19 mA/A + 2.2 mA	Fluke 5520A/SC1100

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
	150 A to 550 A	24 mA/A + 35 mA	50 turn coil
	550 A to 1 000 A	47 mA/A + 150 mA	
AC Current, Source (30 to 330) uA	10 Hz to 20 Hz	2.1 nA/µA + 420 nA	Fluke 5520A/SC1100
	20 Hz to 45 Hz	1.5 nA/µA + 430 nA	
	45 Hz to 1 kHz	1 nA/µA + 430 nA	
	1 kHz to 5 kHz	1.3 nA/µA + 5.2 µA	
	5 kHz to 10 kHz	5.2 nA/µA + 5 µA	
	10 kHz to 30 kHz	2.3 nA/µA + 35 µA	
AC Current, Source (0.33 to 3.3) mA	10 Hz to 20 Hz	2.3 µA/mA+ 0.98 µA	Fluke 5520A/SC1100
	20 Hz to 45 Hz	1.3 µA/mA+ 0.97 µA	
	45 Hz to 1 kHz	0.89 µA/mA+ 0.93 µA	
	1 kHz to 5 kHz	4 µA/mA + 3.8 µA	
	5 kHz to 10 kHz	9.2 µA/mA + 2.8 µA	
	10 kHz to 30 kHz	8.7 µA/mA + 29 µA	
AC Current, Source (3.3 to 33) mA	10 Hz to 20 Hz	2.2 µA/mA + 4.5 µA	Fluke 5520A/SC1100
	20 Hz to 45 Hz	0.97 µA/mA + 4.1 µA	
	45 Hz to 1 kHz	0.69 µA/mA + 4.8 µA	
	1 kHz to 5 kHz	2.6 µA/mA + 4.9 µA	
	5 kHz to 10 kHz	6 µA/mA + 5.1 µA	
	10 kHz to 30 kHz	9 µA/mA 9.8 µA	
AC Current, Source (33 to 330) mA	10 Hz to 20 Hz	2.2 µA/mA + 45 µA	Fluke 5520A/SC1100
	20 Hz to 45 Hz	0.98 µA/mA + 41 µA	
	45 Hz to 1 kHz	0.41 µA/mA + 44 µA	
	1 kHz to 5 kHz	1 µA/mA + 63 µA	
	5 kHz to 10 kHz	2.2 µA/mA + 110 µA	
	10 kHz to 30 kHz	6.3 µA/mA + 170 µA	
AC Current, Source (0.33 to 1.1) A	10 Hz to 45 Hz	1.7 mA/A + 1.7 mA	Fluke 5520A/SC1100
	45 Hz to 1 kHz	0.31 mA/A + 2 mA	
	1 kHz to 5 kHz	9.8 mA/A + 1.5 mA	
	5 kHz to 10 kHz	27 mA/A + 8.3 mA	
AC Current, Source (1.1 to 3) A	10 Hz to 45 Hz	2.3 mA/A + 1.1 mA	Fluke 5520A/SC1100
	45 Hz to 1 kHz	0.58 mA/A + 1.7 mA	

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
	1 kHz to 5 kHz	10 mA/A + 1.1 mA	
	5 kHz to 10 kHz	30 mA/A + 6.1 mA	
AC Current, Source (3 to 11) A	45 Hz to 100 Hz	1.7 mA/A + 3.3 mA	Fluke 5520A/SC1100
	100 Hz to 1 kHz	1.3 mA/A + 3.4 mA	
	1 kHz to 5 kHz	31 mA/A + 3 mA	
AC Current, Source (11 to 20) A	45 Hz to 100 Hz	2 mA/A + 5.3 mA	Fluke 5520A/SC1100
	100 Hz to 1 kHz	1.7 mA/A + 6 mA	
	1 kHz to 5 kHz	31 mA/A + 6.6 mA	
AC Current, Source (50 to 150) A	45 Hz to 1 kHz	18 mA/A + 190 mA	Fluke 5520A/SC1100 50 turn coil
AC Current, Source (150 to 550) A	45 Hz to 100 Hz	85 mA/A + 190 mA	Fluke 5520A/SC1100 50 turn coil
	100 Hz to 1 kHz	62 mA/A + 200 mA	
AC Current, Source (550 to 1000) A	45 Hz to 100 Hz	99mA/A + 320 mA	Fluke 5520A/SC1100 50 turn coil
	100 Hz to 1 kHz	83 mA/A + 360 mA	
DC Power, Source	(0 to 336) W	0.04% of output	Fluke 5520A/SC1100
	(336 to 3 060) W	0.054% of output	
	(3 060 to 20 910) W	0.13% of output	
AC Power, Source (45 to 65) Hz	0.11 mW to 3 mW	0.19% of output	Fluke 5520A/SC1100
	3 mW to 11 mW	0.14% of output	
	11 mW to 30 mW	0.17% of output	
	30 mW to 110 mW	0.12% of output	
	110 mW to 300 mW	0.29% of output	
	0.3 W to 0.73 W	0.18% of output	
	0.73 W to 1.5 W	0.28% of output	
	1.5 W to 6.8 W	0.26% of output	
	6.8 W to 9.2 W	0.19% of output	
	9.2 W to 34 W	0.14% of output	
	34 W to 92 W	0.17% of output	
	92 W to 337 W	0.12% of output	Fluke 5520A/SC1100
	337 W to 918 W	0.29% of output	
	918 W to 2 244 W	0.18% of output	
	2 244 W to 4 590 W	0.28% of output	
	4 590 W to 20 910 W	0.26% of output	

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
DC Current, Measure	0 µA to 10 µA	0.0071 nA/µA + 0.67 nA	Agilent 3458A System Multimeter
	10 µA to 100 µA	0.019 nA/µA + 0.99 nA	
	100 µA to 1 000 µA	0.018 nA/µA + 7.5 nA	
	1 mA to 10 mA	18 nA/mA + 76 nA	
	10 mA to 100 mA	0.034 µA/mA + 0.69 µA	
	100 ma to 1 000 mA	0.11 µA/mA + 16 µA	
	1 A to 5 A	0.001 A	Agilent 3458A System Multimeter and current shunt
	5 A to 10 A	0.002 A	
	10 A to 50 A	0.01 A	
	50 A to 100 A	0.02 A	
	100 A to 150 A	0.03 A	
AC Current, Measure (0 to 100) uA	10 Hz to 20 Hz	4 nA/µA + 31 nA	Agilent 3458A System Multimeter
	20 Hz to 45 Hz	1.5 nA/µA + 31 nA	
	45 Hz to 100 Hz	0.59 nA/µA + 32 nA	
	100 Hz to 5 kHz	0.59 nA/µA + 32 nA	
AC Current, Measure (0.1 to 1) mA	10 Hz to 20 Hz	4 µA/mA + 0.2 µA	Agilent 3458A System Multimeter
	20 Hz to 45 Hz	1.5 µA/mA + 0.2 µA	
	45 Hz to 100 Hz	0.6 µA/mA + 0.2 µA	
	100 Hz to 5 kHz	0.3 µA/mA + 0.21 µA	
	5 kHz to 20 kHz	0.6 µA/mA + 0.2 µA	
	20 kHz to 50 kHz	4 µA/mA + 0.4 µA	
	50 kHz to 100 kHz	5.5 µA/mA + 1.5 µA	
AC Current, Measure (1 to 10) mA	10 Hz to 20 Hz	4 µA/mA + 2 µA	Agilent 3458A System Multimeter
	20 Hz to 45 Hz	1.5 µA/mA + 2 µA	
	45 Hz to 100 Hz	0.6 µA/mA + 2.1 µA	
	100 Hz to 5 kHz	0.3 µA/mA + 2.1 µA	
	5 kHz to 20 kHz	0.6 µA/mA + 2.1 µA	
	20 kHz to 50 kHz	4 µA/mA + 4 µA	Agilent 3458A System Multimeter
	50 kHz to 100 kHz	5.5 µA/mA + 15 µA	
AC Current, Measure (10 to 100) mA	10 Hz to 20 Hz	4 µA/mA + 20 µA	Agilent 3458A System Multimeter
	20 Hz to 45 Hz	1.5 µA/mA + 21 µA	
	45 Hz to 100 Hz	0.6 µA/mA + 21 µA	
	100 Hz to 5 kHz	0.3 µA/mA + 21 µA	

Calibration Parameter/Equipment[1]	Range	Best Measurement Capability(+/-) [2]	Remarks
	5 kHz to 20 kHz	0.6 μA/mA + 21 μA	
	20 kHz to 50 kHz	4 μA/mA + 40 μA	
	50 kHz to 100 kHz	5.5 μA/mA + 150 μA	
AC Current, Measure (100 to 1000) mA	10 Hz to 20 Hz	4 μA/mA + 200 μA	Agilent 3458A System Multimeter
	20 Hz to 45 Hz	1.6 μA/mA + 210 μA	
	45 Hz to 100 Hz	0.8 μA/mA + 210 μA	
	100 Hz to 5 kHz	1 μA/mA + 210 μA	
	5 kHz to 20 kHz	3 μA/mA + 200 μA	
	20 kHz to 50 kHz	10 μA/mA + 400 μA	
AC Current, Measure (1 to 5) A	45 Hz to 400 Hz	0.0012 A	Agilent 3458A System Multimeter and current shunt
AC Current, Measure (5 to 10) A	45 Hz to 400 Hz	0.0024 A	Agilent 3458A System Multimeter and current shunt
AC Current, Measure (10 to 50) A	45 Hz to 400 Hz	0.012 A	Agilent 3458A System Multimeter and current shunt
AC Current, Measure (50 to 100) A	45 Hz to 400 Hz	0.024 A	Agilent 3458A System Multimeter and current shunt
AC Current, Measure (100 to 150) A	45 Hz to 400 Hz	0.036 A	Agilent 3458A System Multimeter and current shunt

Electricity and Magnetism – Capacitance

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-)[2]	Remarks
Capacitance, Source[1]	0.19 nF to 0.4 nF	0.014 nF	Fluke 5520A/SC1100
	0.4 nF to 1.1 nF	0.015 nF	
	1.1 nF to 3.3 nF	0.016 nF	
	3.3 nF to 11 nF	0.017 nF	
	11 nF to 33 nF	0.11 nF	
	33 nF to 110 nF	0.14 nF	
	110 nF to 330 nF	0.42 nF	
	0.33 μF to 1.1 μF	1.4 nF	
	1.1 μF to 3.3 μF	4.2 nF	
	3.3 μF to 11 μF	14 nF	
	11 μF to 33 μF	46 nF	
	33 μF to 110 μF	190 nF	
	110 μF to 330 μF	550 nF	
	0.33 mF to 1.1 mF	1.6 μF	
	1.1 mF to 3.3 mF	4.4 μF	

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-)[2]	Remarks
	3.3 mF to 11 mF	15 µF	
	11 mF to 33 mF	53 µF	
	33 mF to 110 mF	210 µF	

Electricity and Magnetism – Electrical Temperature Simulation

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Thermocouple Calibration [1] Electronic Type B	600 °C to 800 °C	0.47 °C	Fluke 5520A/SC1100
	800 °C to 1000 °C	0.38 °C	
	1000 °C to 1550 °C	0.34 °C	
	1550 °C to 1820 °C	0.37 °C	
Type C	0 °C to 150 °C	0.31 °C	Fluke 5520A/SC1100
	150 °C to 650 °C	0.27 °C	
	650 °C to 1000 °C	0.32 °C	
	1000 °C to 1800 °C	0.51 °C	
	1800 °C to 2316 °C	0.84 °C	
Type E	-250 °C to -100 °C	0.5 °C	Fluke 5520A/SC1100
	-100 °C to -25 °C	0.16 °C	
	-25 °C to 350 °C	0.14 °C	
	350 °C to 650 °C	0.16 °C	
	650 °C to 1000 °C	0.21 °C	
Type J	-210 °C to -100 °C	0.27 °C	Fluke 5520A/SC1100
	-100 °C to -30 °C	0.16 °C	
	-30 °C to 150 °C	0.14 °C	
	150 °C to 760 °C	0.17 °C	
	760 °C to 1200 °C	0.23 °C	
Type K	-200 °C to -100 °C	0.33 °C	Fluke 5520A/SC1100
	-100 °C to -25 °C	0.18 °C	
	-25 °C to 120 °C	0.16 °C	
	120 °C to 1000 °C	0.26 °C	
	1000 °C to 1372 °C	0.4 °C	
Type N	-200 °C to -100 °C	0.4 °C	Fluke 5520A/SC1100
	-100 °C to -25 °C	0.22 °C	
	-25 °C to 120 °C	0.19 °C	

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Type N	120 °C to 410 °C	0.18 °C	Fluke 5520A/SC1100
	410 °C to 1300 °C	0.27 °C	
Type R	0 °C to 250 °C	0.6 °C	Fluke 5520A/SC1100
	250 °C to 400 °C	0.4 °C	
	400 °C to 1000 °C	0.39 °C	
	1000 °C to 1767 °C	0.45 °C	
Type S	0 °C to 250 °C	0.51 °C	Fluke 5520A/SC1100
	250 °C to 400 °C	0.41 °C	
	400 °C to 1000 °C	0.42 °C	
	1000 °C to 1767 °C	0.5 °C	
Type T	-250 °C to -150 °C	0.63 °C	Fluke 5520A/SC1100
	-150 °C to 0 °C	0.24 °C	
	0 °C to 120 °C	0.16 °C	
	120 °C to 400 °C	0.14 °C	
RTD Calibration [1] Electronic Cu 427, 10 Ω	-100 °C to 260 °C	0.3 °C	Fluke 5520A/SC1100
RTD Calibration [1] Electronic PtNi 385, 120 ohm	-80 °C to 0 °C	0.081 °C	Fluke 5520A/SC1100
	0 °C to 100 °C	0.081 °C	
	100 °C to 260 °C	0.14 °C	
RTD Calibration [1] Electronic Pt 3916, 100 Ω	-200 °C to -190 °C	0.25 °C	Fluke 5520A/SC1100
	-190 °C to -80 °C	0.041 °C	
	-80 °C to 0 °C	0.051 °C	
	0 °C to 100 °C	0.061 °C	
	100 °C to 260 °C	0.071 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.09 °C	
	400 °C to 600 °C	0.1 °C	
	600 °C to 630 °C	0.23 °C	
RTD Calibration [1] Electronic Pt 3926, 100 Ω	-200 °C to -80 °C	0.051 °C	Fluke 5520A/SC1100
	-80 °C to 0 °C	0.051 °C	
	0 °C to 100 °C	0.071 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.1 °C	

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
	400 °C to 630 °C	0.12 °C	
RTD Calibration[1] Electronic Pt 385, 200 Ω	-200 °C to -80 °C	0.043 °C	Fluke 5520A/SC1100
	-80 °C to 0 °C	0.043 °C	
	0 °C to 100 °C	0.043 °C	
	100 °C to 260 °C	0.053 °C	
	260 °C to 300 °C	0.12 °C	
	300 °C to 400 °C	0.13 °C	
	400 °C to 600 °C	0.14 °C	
	600 °C to 630 °C	0.16 °C	
RTD Calibration[1] Electronic Pt 385, 500 Ω	-200 °C to -80 °C	0.056 °C	Fluke 5520A/SC1100
	-80 °C to 0 °C	0.064 °C	
	0 °C to 100 °C	0.064 °C	
	100 °C to 260 °C	0.072 °C	
	260 °C to 300 °C	0.089 °C	
	300 °C to 400 °C	0.089 °C	
	400 °C to 600 °C	0.098 °C	
	600 °C to 630 °C	0.12 °C	
RTD Calibration[1] Electronic Pt 385, 1000 Ω	-200 °C to -80 °C	0.08 °C	Fluke 5520A/SC1100
	-80 °C to 0 °C	0.08 °C	
	0 °C to 100 °C	0.084 °C	
	100 °C to 260 °C	0.089 °C	
	260 °C to 300 °C	0.095 °C	
	300 °C to 400 °C	0.1 °C	
	400 °C to 600 °C	0.1 °C	
	600 °C to 630 °C	0.24 °C	
RTD Calibration[1] Electronic Pt 395, 100 Ω	-200 °C to -80 °C	0.051 °C	Fluke 5520A/SC1100
	-80 °C to 0 °C	0.051 °C	
	0 °C to 100 °C	0.071 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.1 °C	
	400 °C to 630 °C	0.12 °C	
	630 °C to 800 °C	0.23 °C	

Electricity and Magnetism / Time and Frequency – Oscilloscopes

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
DC Voltage, Source[1] Oscilloscopes into 50 Ω	0 mV to 25 mV	100 µV	Fluke 5520A/SC1100
	25 mV to 110 mV	330 µV	
	0.11 V to 2.2 V	5.5 mV	
	2.2 V to 6.6 V	17 mV	
DC Voltage, Source[1] Oscilloscopes into 1M Ω	0 mV to 25 mV	54 µV	Fluke 5520A/SC1100
	25 mV to 110 mV	54 µV	
	0.11 V to 2.2 V	1.2 mV	
	2.2 V to 11 V	5.7 mV	
	11 V to 130 V	90 mV	
Square Wave, Source[1] Oscilloscopes into 50 Ω	0 mV to 25 mV	100 µV	Fluke 5520A/SC1100
	25 mV to 110 mV	330 µV	
	0.11 V to 2.2 V	5.5 mV	
	2.2 V to 6.6 V	17 mV	
Square Wave, Source[1] Oscilloscopes into 1M Ω	0 mV to 25 mV	66 µV	Fluke 5520A/SC1100
	25 mV to 110 mV	170 µV	
	0.11 V to 2.2 V	2.3 mV	
	2.2 V to 11 V	11 mV	
	11 V to 130 V	140 mV	
Leveled Sine Wave Amplitude 50 kHz (reference)	5 mV to 5.5 V	22 mV/V + 21 µV	Fluke 5520A/SC1100
Leveled Sine Wave Amplitude 50 kHz to 100 MHz	5 mV to 5.5 V	36 mV/V + 13 µV	Fluke 5520A/SC1100
Leveled Sine Wave Amplitude 100 MHz to 300 MHz	5 mV to 5.5 V	41 mV/V + 11 µV	Fluke 5520A/SC1100
Leveled Sine Wave Amplitude 300 MHz to 600 MHz	5 mV to 5.5 V	61 mV/V + 7.9 µV	Fluke 5520A/SC1100
Leveled Sine Wave Amplitude 600 MHz to 1100 MHz	5 mV to 3.5 V	71 mV/V + 6.7 µV	Fluke 5520A/SC1100
Leveled Sine Wave Flatness Relative to 50 kHz 50 kHz to 100 MHz	5 mV to 5.5 V	20 mV/V + 3 µV	Fluke 5520A/SC1100
Leveled Sine Wave Flatness Relative to 50 kHz 100 MHz to 300 MHz	5 mV to 5.5 V	24 mV/V + 2 µV	Fluke 5520A/SC1100

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Leveled Sine Wave Flatness Relative to 50 kHz 300 MHz to 600 MHz	5 mV to 5.5 V	42 mV/V + 1 µV	Fluke 5520A/SC1100
Leveled Sine Wave Flatness Relative to 50 kHz 600 MHz to 1100 MHz	5 mV to 3.5 V	52 mV/V + 3 µV	Fluke 5520A/SC1100
Level Sine Wave Frequency	50 kHz to 1100 MHZ	2.7 Hz/1 MHz	Fluke 5520A/SC1100
Leading Edge Risetime[1]	5 mV to 2.5 V	320 ps	Fluke 5520A/SC1100
Time Markers[1]	1 ns to 20 ms	2.7 ps/s	Fluke 5520A/SC1100
	50 ms	3.8 µs	
	0.1 s	13 µs	
	0.2 s	45 µs	
	0.5 s	260 µs	
	1 s	1 ms	
	2 s	4.1 ms	
	5 s	25 ms	

Time and Frequency – Frequency / Period

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Time Markers[1]	1 ns to 20 ms	2.7 ps/s	Fluke 5520A/SC1100
	50 ms	3.8 µs	
	0.1 s	13 µs	
	0.2 s	45 µs	
	0.5 s	260 µs	
	1 s	1 ms	
	2 s	4.1 ms	
	5 s	25 ms	

Time and Frequency – Time Dissemination

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Stopwatches and Timers	0 h to 3 h	0.04 s	Frequency Counter

Thermodynamic – Humidity

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Humidity Source	10 % RH to 90 % RH	3.1% RH	Saturated Salts & Thermohygrometer

Thermodynamic – Thermocouples

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Temperature Generate	-40 °C to 260 °C	0.11 °C	Temperature Bath & SPRT
	50 °C to 600 °C	1.2 °C	Drywell calibrator & SPRT

Thermodynamic – Thermodynamic Devices (all)

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Temperature Generate	-40 °C to 260 °C	0.11 °C	Temperature Bath & SPRT
	50 °C to 600 °C	1.2 °C	Drywell calibrator & SPRT

Thermodynamic – Standard Platinum Resistance Thermometers

Calibration Parameter/Equipment	Range	Best Measurement Capability(+/-) [2]	Remarks
Temperature Generate	-40 °C to 260 °C	0.11 °C	Temperature Bath & SPRT
	50 °C to 600 °C	1.2 °C	Drywell calibrator & SPRT

Notes:

1) Laboratory offers calibration services at the laboratory's own facilities and at the client or other agreed upon facilities.
2) Best uncertainties represent expanded uncertainties at approximately the 95% confidence level using a coverage factor of k=2.
3) *L* = Length in inches, *D* = Diameter in inches, *PD* = Pitch Diameter in inches, *H* = Height in inches

Approved by: _____ Date: December 18, 2009

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