

Scope of Accreditation For OCS Technologies, Inc. (dba: Ohio Counting Scale / Omni Calibration Services)

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In recognition of a successful assessment to ISO/IEC 17025:2005, accreditation is granted to **OCS Technologies, Inc.** to perform **Calibrations / Dimensional Inspection** as shown in the following tables:

Accreditation Granted Through: **November 27, 2013**

Calibration

Length – Artifacts and Standards 1D

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Gage Blocks ⁶ Chrome Carbide	(0.01 to 4) in	(5 + 1.5L) μin	P&W LabMaster Universal and Grade 0.5 Gage Blocks
Steel, Ceramic, Tungsten Carbide	(0.01 to 4) in	(5.6 + 3.1L) μin	P&W LabMaster Universal and Grade 1 Gage Blocks
Steel	(5 to 12) in	(4 + 3.1L) μin	
Plug /Pin Gages & Master Discs ⁶ Class XXX, XX, X, Y, Z, ZZ	(0.01 to 0.06) in	11 μin	P&W LabMaster Universal and Grade 1 Gage Blocks
	(0.06 to 1) in	8 μin	
	(1 to 12) in	(3.2 + 4D) μin	
Pin Gages ² Class ZZ	(0.01 to 2) in	78 μin	Comparisons with Laser Micrometer
Micrometer/Length/End Standards ⁶	(1 to 12) in	(4 + 4.2L) μin	P&W LabMaster Universal and Grade 1 Gage Blocks
Ring Gages ⁶	(0.04 to 1) in	18 μin	P&W LabMaster Universal, Grade 1 Gage Blocks and Master Rings
	(1 to 12) in	(8.4 + 3.9D) μin	
Spheres/Precision Balls	(0.1 to 3) in	15 μin	P&W LabMaster Universal and Grade 1 Gage Blocks

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Thread Wires ³ 2 TPI to 120 TPI	(0.004 to 0.289) in	13 μin	P&W LabMaster Universal and Grade 1 Gage Blocks

Length – Artifacts and Standards 2D

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Thread Plug Gages – Straight Major Diameter	(0.06 to 6) in	53 μin	P&W LabMaster Universal and Grade 1 Gage Blocks with Thread Wires
Pitch Diameter	(4 thru 80) TPI	78 μin	
Thread Plug Gages – Straight ² Major Diameter	(0.06 to 1) in	66 μin	Comparisons to Universal Measurement Machine with Thread Wires
Pitch Diameter	(4 thru 80) TPI	89 μin	
Thread Plug Gages ³ / ₄ TPF	(0.3 to 6) in	69 μin	P&W LabMaster Universal and Grade 1 Gage Blocks with Thread Wires
Pitch Diameter	(8 thru 27) TPI	90 μin	
Thread Ring Gages	(0.06 to 12) in	84 μin	In Accordance with ASME B1.2, Paragraph 5.1.1; the Ring is Sized to a Plug with the Plug's Uncertainty Given. Class X or W Set Plugs to be Used as Available
Functional Pitch Diameter	(4 thru 80) TPI		

Length – Hand Tools and Precision Gages 1D

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability (+/-)	Remarks
Micrometers ^{2,6}	(0 to 4) in	(98 + 4L) μin	Comparisons performed with Gage Blocks
	(4 to 80) in	(58 + 10L) μin	
Calipers ^{2,6}	(0 to 4) in	(100 + 4L) μin	
	(4 to 80) in	(298 + 4L) μin	
Height Gages ^{2,6}	(0 to 4) in	(161 + 2L) μin	
	(4 to 60) in	(271 + 8L) μin	
Dial/Test Indicators ²	(0 to 1) in	81 μin	Comparisons performed with Universal Measurement Machine
Dial/Test Indicators	(0 to 1) in	34 μin	P&W LabMaster Universal and Grade 1 Gage Blocks
	(1 to 4) in	293 μin	

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability (+/-)	Remarks
Indicating Snap Gages ^{2,6}	(0 to 4) in	(100 + 4L) μin	Comparisons performed with Gage Blocks
	(4 to 40) in	(551 + 6L) μin	
Bore Gages – 2 Point ^{2,6}	(0.125 to 4) in	(100 + 4L) μin	Comparisons performed with Gage Blocks and End Caps
	(4 to 40) in	(257 + 8L) μin	
Rulers	(0 to 72) in	0.023 in	Comparisons performed with Gage Blocks
Bench/Super Micrometer ²	(0.1 to 2) in	24 μin	Comparisons performed with Grade 2 Gage Blocks

Length – Hand Tools and Precision Gages 1D Non-Contact

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Laser Micrometers ²	(0.06 to 1) in	61 μin	Master Plug Gages

Length – Hand Tools and Precision Gages 2D

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Optical Comparators ² X axis and Y axis	(0 to 12) in	180 μin	Comparisons to Optical Comparator Scale and Gage Blocks
		180 μin	
Magnification	10x, 20x, 31.5x, 50x, 62.5x, 100x	180 μin	
Angle	5°, 10°, 15°, 20°, 25°, 30°	0.12°	Comparison performed with Angle Blocks
Protractors	0°, 5°, 10°, 15°, 20°, 25°, 30°	0.11°	Comparisons performed with Angle Blocks and Surface Plates
Angle	0° to 90°	0.27°	Digital Protractor
Level	0°	0.27°	
Bore Gages – 3 point ^{2,6}	(0.125 to 7) in	(101 + 9L) μin	Comparisons performed with Customer Ring Gages calibrated by OCS

Mass – Hardness

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Indirect Verification of Rockwell Hardness Testers ²	HRC		Indirect Verification per ASTM E18
	Low	0.38 HRC	
	Middle	0.35 HRC	
	High	0.32 HRC	

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Indirect Verification of Rockwell Hardness Testers ²	HRBW Low Middle High	0.71 HRBW 0.72 HRBW 0.73 HRBW	Indirect Verification per ASTM E18
	HRA Low Middle High	0.48 HRA 0.39 HRA 0.53 HRA	
	HR15N Low Middle High	0.50 HR15N 0.48 HR15N 0.43 HR15N	
	HR30N Low Middle High	0.73 HR30N 0.73 HR30N 0.53 HR30N	
	HR15TW Low Middle High	0.73 HR15TW 0.64 HR15TW 0.44 HR15TW	
	HR30TW Low Middle High	0.58 HR30TW 0.55 HR30TW 0.46 HR30TW	
	HR45TW Low Middle High	0.64 HR45TW 0.67 HR45TW 0.42 HR45TW	
Indirect Verification of Brinell Hardness Testers at Test Conditions: ² 10/3000/15	125 < HBW ≤ 225	4.5 HBW	Indirect Verification per ASTM E10
	HBW > 225	6.2 HBW	

Mass – Torque

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Torque Wrenches, Drivers, Screwdrivers including Click Type ²	(10 to 100) in·ozf	1.9 % of reading	Torque Tester and Torque Cells
	(100 to 500) in·ozf		
	(10 to 100) in·lbf		
	(5 to 50) ft·lbf		
	(50 to 500) ft·lbf		

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Torque Transducers, Torque Analyzers, Dial Torque Wrenches ²	(3 to 640) in·ozf	0.08 % of reading + 0.11 in·ozf	Torque Arms and ASTM Class 6 Weights
	(7.5 to 1200) in·lbf	0.09 % of reading + 0.05 in·lbf	
	(100 to 1000) ft·lbf	0.04 % of reading + 0.05 ft·lbf	

Mass – Mass Artifacts

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Weights	1 mg to 160 g	0.57 mg	Comparison using High Resolution Scales that have been Calibrated with ASTM Class 1 Test Weights
	(160 to 400) g	3.2 mg	
Weights ²	(0.8 to 10) lb	0.000 07 lb	Comparison Using High Resolution Scales That Have Been calibrated with ASTM Class 3 Test Weights
	(10 to 27.5) lb	0.0007 lb	
	(27.5 to 70) lb	0.0017 lb	

Mass – Pressure / Low Vacuum

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Pressure Transducers, Dial and Digital Pressure Gages, Absolute Pressure Instruments, Low Vacuum Gages ^{2,4}	(0.001 to 1) inH ₂ O	0.006 inH ₂ O	Comparisons to a Manometer
	(1 to 20) inH ₂ O	0.05 inH ₂ O	
	(-0.01 to -14.5) psi	0.06 psi	Comparisons to Digital Pressure Gages
	(0.2 to 100) psia	0.06 psia	
	(0.01 to 60) psi	0.08 psi	
	(60 to 120) psi	0.15 psi	
	(120 to 180) psi	0.22 psi	
	(180 to 240) psi	0.28 psi	
	(240 to 300) psi	0.35 psi	
	(300 to 1000) psi	0.44 psi	
	(1000 to 2000) psi	2.5 psi	
	(2000 to 4000) psi	4.8 psi	
	(4000 to 6000) psi	7 psi	
	(6000 to 8000) psi	9.3 psi	
	(8000 to 10 000) psi	11.6 psi	
(10 000 to 30 000) psi	71 psi		

Mass – Force

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Force –Tension & Compression ^{2,7} (Force Gages, Load Cells with Indicators, Testing Machines)	(0.1 to 2) lbf	0.002 lbf	ASTM Class 6 Weights
	(2 to 10) lbf	0.005 lbf	
	(10 to 50) lbf	0.030 lbf	
	(50 to 100) lbf	0.050 lbf	
	(27 to 1000) lbf	0.19 lbf	Morehouse Precision Load Cell
	(1000 to 10 000) lbf	0.41 lbf	
	(10 000 to 20 000) lbf	59 lbf	Force Indicator and Load Cell
Force Testing Machine Crosshead Travel	(0.1 to 6) in	0.002 in	Digital Caliper
Force Testing Machine Crosshead Speed	(0.5 to 12) in/min	0.04 in/min	Digital Stopwatch/Caliper
Durometers – Spring Force	Type A, B, C, D, DO, O, OO	0.6 Duros	Balance / ASTM Class 6 Test Weights
Bench Micrometer Contact Force	(2 to 32) ozf	0.8 ozf	Force Gages
	(32 to 40) ozf	2.2 ozf	

Mass – Scales and Balances

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Weighing Systems ^{1,2}	(0 to 500) mg	0.12 mg	ASTM E617 Class 1 Weights and NIST Handbook 44 utilized for the calibration of the Weighing System
	(1 to 20) g	0.005 % applied load	
	(21 to 60 000) g	0.000 3 % applied load	
	(0.005 to 120 000) lb	0.013 % applied load	NIST Class F Weights and NIST Handbook 44 utilized for the calibration of the Weighing System

Electrical – Voltage

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
DC Volts – Source ²	(0 to 330) mV	24 μ V/V + 3 μ V	Comparisons performed with Multifunction Calibrator
	330 mV to 3.3 V	13 μ V/V + 14 μ V	
	(3.3 to 33) V	14 μ V/V + 131 μ V	

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
DC Volts – Source ²	(33 to 330) V	21 μ V/V + 1.3 μ V	Comparisons performed with Multifunction Calibrator
	(330 to 1000) V	21 μ V/V + 13 μ V	
AC Volts – Source ² 1 mV to 33 mV	(10 to 45) Hz	930 μ V/V + 8 μ V	Comparisons performed with Multifunction Calibrator
	45 Hz to 10 kHz	180 μ V/V + 8 μ V	
	(10 to 20) kHz	240 μ V/V + 8 μ V	
	(20 to 50) kHz	1.2 μ V/V + 8 μ V	
	(50 to 100) kHz	4.1 μ V/V + 15 μ V	
	(100 to 500) kHz	9.3 mV/V + 58 μ V	
33 mV to 330 mV	(10 to 45) Hz	580 μ V/V + 10 μ V	
	45 Hz to 10 kHz	170 μ V/V + 11 μ V	
	(10 to 20) kHz	190 μ V/V + 10 μ V	
	(20 to 50) kHz	410 μ V/V + 13 μ V	
	(50 to 100) kHz	930 μ V/V + 39 μ V	
	(100 to 500) kHz	2.4 mV/V + 87 μ V	
330 mV to 3.3 V	(10 to 45) Hz	347 μ V/V + 100 μ V	
	45 Hz to 10 kHz	174 μ V/V + 145 μ V	
	(10 to 20) kHz	220 μ V/V + 116 μ V	
	(20 to 50) kHz	347 μ V/V + 68 μ V	
	(50 to 100) kHz	810 μ V/V + 178 μ V	
	(100 to 500) kHz	2.8 mV/V + 840 μ V	
3.3 V to 33 V	(10 to 45) Hz	347 μ V/V + 884 μ V	
	45 Hz to 10 kHz	174 μ V/V + 904 μ V	
	(10 to 20) kHz	278 μ V/V + 904 μ V	
	(20 to 50) kHz	405 μ V/V + 835 μ V	
	(50 to 100) kHz	1.1 mV/V + 2.1 mV	
33 V to 330 V	45 Hz to 1 kHz	220 μ V/V + 5.2 mV	
	(1 to 10) kHz	231 μ V/V + 7.8 mV	
	(10 to 20) kHz	289 μ V/V + 7.4 mV	
	(20 to 50) kHz	347 μ V/V + 7.4 mV	
	(50 to 100) kHz	2.4 mV/V + 58 mV	

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
330 V to 1000 V	45 Hz to 1 kHz	2.4 mV/V + 58 mV	Comparisons performed with Multifunction Calibrator
	(1 to 5) kHz	2.4 mV/V + 58 mV	
	(5 to 10) kHz	2.4 mV/V + 58 mV	
DC Volts – Measure ²	(0 to 1) V	14 μV	Measured with an 8 ½ Digit Multimeter
	(1 to 10) V	122 μV	
	(10 to 100) V	1.5 mV	
	(100 to 1000) V	15 mV	
AC Volts – Measure ² 45 Hz to 1 kHz	(1 to 10) mV	4 μV	Measured with an 8 ½ Digit Multimeter
	(10 to 100) mV	12 μV	
	100 mV to 1 V	116 μV	
	(1 to 10) V	1.2 mV	
	(10 to 100) V	28 mV	
	(100 to 700) V	372 mV	
DC High Voltage – Measure ²	(0.5 to 2) kV	0.09 V/kV + 7 V	Comparisons performed with a Precision HV Meter
	(2 to 40) kV	0.39 + V/kV + 14 V	
DC High Voltage – Measure 50 Hz to 60 Hz	(0.5 to 2) kV	0.23 + V/kV + 7 V	
	(2 to 25) kV	4.7 V/kV + 70 V	
Thermocouple Millivolt Simulation ² Type J	(-220 to 400)	0.51	Comparisons performed with Multifunction Calibrator and Thermocouple Indicator
	(401 to 800)	0.77	
	(801 to 1180)	1.2	
Type K	(-200 to 400)	0.5	
	(401 to 800)	0.76	
	(801 to 1370)	1.24	
Type T	(-250 to 0)	0.35	
	(1 to 380)	0.44	
Type E	(-100 to 400)	0.44	
	(401 to 990)	1.1	
Type R	(0 to 1767)	0.93	
Type S	(0 to 1767)	0.85	

Electrical – Resistance

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Resistance – Source ²	(0 to 33) Ω	35 μΩ/Ω + 240 μΩ	Comparisons performed with a Multifunction Calibrator
	(33 to 330) Ω	33 μΩ/Ω + 2.4 mΩ	
	330 Ω to 33 kΩ	33 μΩ/Ω + 24 mΩ	
	(33 to 330) kΩ	37 μΩ/Ω + 240 mΩ	
	330 kΩ to 3.3 MΩ	70 μΩ/Ω + 2.4 Ω	
	(3.3 to 33) MΩ	300 μΩ/Ω + 24 Ω	
	(33 to 110) MΩ	600 μΩ/Ω + 240 Ω	
	(110 to 330) MΩ	4 mΩ/Ω + 240 Ω	
	330 MΩ to 1.1 GΩ	18 mΩ/Ω + 2400 Ω	
	(1 to 10.05) GΩ	1.2 % of reading	
	18.24 GΩ	0.64 GΩ	
Resistance – Measure ²	(0 to 10) Ω	23 μΩ/Ω +71 μΩ	Measured with a 8 ½ Digit Multimeter
	(10 to 100) Ω	22 μΩ/Ω +351 μΩ	
	(0.1 to 1) kΩ	17 μΩ/Ω + 8 μΩ	
	(1 to 10) kΩ	17 μΩ/Ω + 2.3 mΩ	
	(10 to 100) kΩ	17 μΩ/Ω + 7.8 mΩ	
	(0.1 to 1) MΩ	21 μΩ/Ω + 5.4 Ω	
	(1 to 10) MΩ	76 μΩ/Ω + 44 Ω	
	(10 to 100) MΩ	642 μΩ/Ω + 444 Ω	
	(0.1 to 1) GΩ	6.3 mΩ/Ω + 23 kΩ	
RTD Resistance Simulation ² Pt 385, 100 Ω	(-200 to 300) °C	0.18 °C	Comparisons performed with Multifunction Calibrator and Electronic Indicator
	(300 to 800) °C	0.46 °C	
Pt 385, 1 000 Ω	(-200 to 300) °C	0.12 °C	
	(100 to 600) °C	0.14 °C	

Electrical – Current

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
DC Current – Source ²	(0 to 30)	174 μA/A + 30 nA	Comparisons performed with a Multifunction Calibrator
	(0 to 3.3) mA	116 μA/A + 60 nA	
	(3.3 to 33) mA	116 μA/A + 300 nA	

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
DC Current – Source ²	(33 to 330) mA	116 μ A/A + 14 μ A	Comparisons performed with a Multifunction Calibrator
	330 mA to 1.1 A	230 μ A/A + 48 μ A	
	(1.1 to 3) A	439 μ A/A + 48 μ A	
	(3 to 11) A	578 μ A/A + 592 μ A	
	(11 to 20.5) A	1.2 mA/A + 876 μ A	
	(20 to 1000) A	9 mA/A + 0.6 mA	
AC Current – Source ²			Comparisons performed with a Multifunction Calibrator
29 μ A to 330 μ A	(10 to 20) Hz	2.4 mA/A + 120 nA	
	(20 to 45) Hz	1.8 mA/A + 120 nA	
	45 Hz to 1 kHz	1.5 mA/A + 120 nA	
	(1 to 5) kHz	3.5 mA/A + 170 nA	
	(5 to 10) kHz	9.3 mA/A + 230 nA	
	(10 to 30) kHz	19 mA/A + 460 nA	
330 μ A to 3.3 mA	(10 to 20) Hz	2.4 mA/A + 170 nA	
	(20 to 45) Hz	1.5 mA/A + 170 nA	
	45 Hz to 1 kHz	1.2 mA/A + 170 nA	
	(1 to 5) kHz	230 nA/A + 230 nA	
	(5 to 10) kHz	5.8 mA/A + 350 nA	
	(10 to 30) kHz	12 mA/A + 690 nA	
AC Current – Source ²			
3.3 mA to 33 mA	(10 to 20) Hz	2.1 mA/A + 2.3 μ A	
	(20 to 45) Hz	1.1 mA/A + 2.3 μ A	
	45 Hz to 1 kHz	462 mA/A + 2.3 μ A	
	(1 to 5) kHz	924 μ A/A + 2.3 μ A	
	(5 to 10) kHz	2.4 μ A/A + 3.5 μ A	
	(10 to 30) kHz	4.7 mA/A + 4.6 μ A	
33 mA to 330 mA	(10 to 20) Hz	2.1 mA/A + 27 μ A	
	(20 to 45) Hz	1.1 mA/A + 27 μ A	
	45 Hz to 1 kHz	462 μ A/A + 27 μ A	
	(1 to 5) kHz	1.2 mA/A + 60 μ A	
	(5 to 10) kHz	2.4 mA/A + 117 μ A	
	(10 to 30) kHz	4.7 mA/A + 232 μ A	

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
330 mA to 3 A	(10 to 45) Hz	2.1 mA/A + 117 μ A	Comparisons performed with a Multifunction Calibrator
	45 Hz to 1 kHz	693 μ A/A + 117 μ A	
	(1 to 5) kHz	7 mA/A + 1.2 mA	
	(5 to 10) kHz	29 mA/A + 5.8 mA	
3 A to 11 A	(45 to 100) Hz	693 μ A/A + 2.4 mA	
	100 Hz 1 kHz	1.2 mA/A + 2.4 mA	
	(1 to 5) kHz	35 mA/A + 2.4 mA	
11 A to 20.5 A	(45 to 100) Hz	1.4 mA/A + 5.8 mA	
	100 Hz 1 kHz	1.7 mA/A + 5.8 mA	
	(1 to 5) kHz	35 mA/A + 5.8 mA	
20 A to 1000 A	(45 to 65) Hz	7.2 mA/A + 584 mA	
	(65 to 440) Hz	7.8 mA/A + 584 mA	
DC Current – Measure ²	(0 to 100) μ A	4.2 nA	
	(0.1 to 1) mA	38 nA	
	(1 to 10) mA	378 nA	
	(10 to 100) mA	6 μ A	
	(0.1 to 1) A	0.16 mA	
	(1 to 30) A	0.38 % of reading	
AC Current – Measure ² 40 Hz to 1 kHz	(0 to 100) μ A	114 nA	
	(0.1 to 1) mA	1.1 μ A	
	(1 to 10) mA	11 μ A	
	(10 to 100) mA	102 μ A	
	(0.1 to 1) A	1.3 mA	
	(1 to 30) A	0.38 % of reading	

Time and Frequency – Frequency / Period

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Tachometers – Non Contact ²	(0.6 to 1000) rpm	0.06 rpm	Comparisons performed with a Frequency Source and LED
	(1000 to 10 000) rpm	0.6 rpm	
	(10 000 to 100 000) rpm	0.65 rpm	
Tachometers – Contact, Centrifuges, RPM Meters ²	(0.6 to 1000) rpm	1.2 rpm	Comparisons performed with a Photo/Contact Tachometer
	(1000 to 10 000) rpm	1.7 rpm	
	(10 000 to 100 000) rpm	8.2 rpm	

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Linear Surface Speed Indicators / Conveyor Belt Speed ²	(3 to 100) ft/min	0.71 ft/min	Comparisons performed with a Contact Tachometer and Wheel
	(100 to 300) ft/min	0.78 ft/min	
	(300 to 1000) ft/min	1.3 ft/min	
Length - Footage Counter, Yardage Counter	(3 to 100) ft	0.75 ft	
	(100 to 300) ft	0.82 ft	
	(300 to 1000) ft	1.4 ft	
Frequency ² – Source	(10 to 119.99) Hz	371 μ Hz	Comparisons performed with a Multifunction Calibrator
	120 Hz to 1.1999 kHz	3.7 mHz	
	(1.2 to 11.999) kHz	0.037 Hz	
	(12 to 119.99) kHz	0.37 Hz	
	120 kHz to 1.2 MHz	3.7 Hz	

Time and Frequency – Oscilloscopes

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Oscilloscopes ²			Comparisons performed with a Multifunction Calibrator and an Oscilloscope
DC Voltage (50 Ω)	1 mV to 6.6 V	2.9 mV/V + 47 μ V	
DC Voltage (1M Ω)	1 mV to 130 V	600 μ V/V + 47 μ V	
AC Voltage (50 Ω)	1 mV to 6.6 Vp-p	2.9 mV/V + 47 μ V	
AC Voltage (1M Ω)	1 mV to 130 Vp-p	1.2 mV/V + 47 μ V	
Leveled Sinewave 50kHz to 600MHz	5 mV to 5.5 V	47 mV/V + 116 μ V	
Time Markers	2 ns to 20 ms	3 μ s/s	
	50 ms to 5 s	2 ms/s + 29 μ s	
Wave Gen. (50 Ω)	1.8 mV to 2.5 Vp-p	35 mV/V + 116 μ V	
Wave Gen. (1M Ω)	1.8 mV to 55 Vp-p	35 mV/V + 116 μ V	
Edge Characteristics 1 kHz to 10 MHz into 50 Ω			Comparisons performed with a Multifunction Calibrator and an Oscilloscope
Amplitude	5 mV to 2.5 V	23 mV/V + 231 μ V	
Risetime	1 nS to 1 μ s	350 ps	

Time and Frequency – Time Dissemination

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Timers / Stopwatches ²	1 s to 4 hr	0.35 s	Comparisons performed with Reference Stopwatch
	(4 to 24) hr	1 s	

Thermodynamics – Thermometers and Probes

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Thermodynamics – Measure (Liquid in Glass Thermometers, Thermocouples, Bi-Metal Thermometers) ²	(-100 to 400) °C	0.14 °C	Comparisons with a Platinum Resistance Thermometer and Bath or Chamber
	(400 to 600) °C	2.8 °C	Dry Block Calibrator
	(600 to 1200) °C	3.1 °C	

Thermodynamics – Thermodynamic Sources

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Thermodynamics – Measure (Temperature Chambers, Drywells, Temperature Baths) ²	(-100 to 400) °C	0.14 °C	Comparisons with a Platinum Resistance Thermometer and Bath or Chamber

Thermodynamics – Infrared (IR) Temperature

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
IR Thermometers ²	(-18 to 148) °C	1.1 °C	Blackbody Calibrator ($\epsilon = 0.95$)

Thermodynamics – Humidity

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
Relative Humidity ²	11.3 % RH	1.5 % RH	Comparisons to Salt Solutions
	75.5 % RH	1.8 % RH	
	95 % RH	2.3 % RH	
	(11 to 75) % RH	2.5 % RH	Comparisons to a Humidity Indicator and Probe
	(75 to 95) % RH	3 % RH	

Amount of Substance – pH / Conductivity

Calibration Parameter/Equipment	Range	Calibration and Measurement Capability(+/-)	Remarks
pH Meters ²	4 pH	0.017 pH	Comparisons to Buffer Solutions
	7 pH	0.036 pH	
	10 pH	0.07 pH	

Dimensional Inspection

Length - Dimensional Inspection – Dimensional Measurement 1D

Inspection Parameter	Range	Calibration and Measurement Capability (+/-)	Remarks
Dimensional Measurement 1D Outside Diameter Length ^{5,6}	(0.1 to 4) in	27µin	P&W LabMaster Universal and Grade 1 Gage Blocks
	(4 to 12) in	(15 + 2.5L) µin	
Dimensional Measurement 1D Inside Diameter ^{5,6}	(0.1 to 4) in	27µin	
	(4 to 12) in	(15 + 2.5L) µin	
Dimensional Measurement 1D Outside Diameter Length ²	(0.000 5 to 1.5) in	59 µin	Universal Measurement Machine
Dimensional Measurement 1D Outside Diameter Length ²	(0.001 to 1) in	175 µin	Digital Micrometer
Dimensional Measurement 1D Outside Diameter Inside Diameter Length Depth ²	(0.001 to 12) in	0.0014 in	Digital Caliper

Calibration and Measurement Capability (CMC) represents expanded uncertainties at approximately a 95% confidence level using a coverage factor of k=2.

Notes:

- 1) The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
- 2) Laboratory offers calibration services at the laboratory's own facilities and at the client or other agreed upon facilities. For calibration at other facilities, Calibration and Measurement capabilities may be higher if a temperature controlled area is not available.
- 3) Uncertainty shown is per wire for thread wire sets.
- 4) Pressures from 10 000 psi to 30 000 psi can only be measured with a customer supplied pressure source.
- 5) Micrometer Masters, Caliper Masters, Feeler Gages & shims would be included in category.
- 6) L = length in inches, D = diameter in inches
- 7) Force capabilities are limited to 20 000 lbf in compression and 12 000 lbf in tension at OCS. Customer setup or testing machine may allow for a higher capacity test.

Approved by: 
R. Douglas Leonard
Chief Technical Officer

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