



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: June 30, 2013

Certificate Number: 1572.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Chemical Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meter	4 pH unit 7 pH unit 10 pH unit	0.014 pH 0.014 pH 0.014 pH	Buffer standards
Conductivity Meter	1015 µS/cm 1408 µS/cm 12.85 mS/cm 111.3 mS/cm	7.0 µS/cm 9.4 µS/cm 0.08 mS/cm 0.76 mS/cm	Buffer standards

II. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Height Gages ³	(0 to 600) mm	2.1 µm/m + 7.6 µm	Step gage
Micrometers ³	Up to 100 mm	0.35 µm/m + 0.81 µm	Gage blocks
Calipers ³	(0 to 600) mm	5.9 µm/m + 7.3 µm	Step gage

Parameter/Equipment	Range	CMC ² (±)	Comments
Displacement Indicators ³	(0 to 25) mm	8.4 µm	Indicator calibrator
	(0 to 100) mm	1.1 µm/m + 0.76 µm	Gage blocks
Gage Blocks ³ – Length Flatness Parallelism	(0 to 100) mm	1.3 µm/m + 0.07 µm 0.08 µm 1.3 µm/m + 0.07 µm	By mechanical comparison with Tesa gage blocks comparator (ASME B89 1.9) optical flat
Metallic Rulers/Scales ³	Up to 900 mm	0.092 mm	Optical electronic scale
Pin Gages	Up to 63 mm	0.46 µm	Laser scan micrometer
Thread Plug Gage ³ – Pitch Diameter	Up to 50 mm	3.8 µm	Three wire method and digital micrometer
Optical Comparator ³ – Magnification 10× only Length	10× to 50×	3.0 µm	Optical scales
	200 mm travel	4.1 µm/m + 1.5 µm	
Surface Texture (Ra) Analyzers/meters ³	3.00 µm Ra 5.98 µm Ra	0.07 µm 0.13 µm	Roughness specimen standards
Indicator Calibrators ³	Up to 25 mm	0.63 µm/m + 0.78 µm	Gage blocks, electronic dimensional comparator
Coating Thickness Gage ³	0.0229 mm 0.0508 mm 0.0775 mm 0.0792 mm 0.1308 mm 0.2554 mm 0.2604 mm 0.5024 mm 0.9929 mm 1.4880 mm 1.5199 mm	0.31 µm 0.33 µm 0.37 µm 0.37 µm 0.77 µm 1.1 µm 0.77 µm 0.77 µm 0.77 µm 0.77 µm 1.5 µm	Defelsko calibration standards

Parameter/Equipment	Range	CMC ² (±)	Comments
Height Master Steel and Ceramic Types	Up to 610 mm	1.4 µm/m + 1.2 µm	Gage block, step gage, electronic dimensional comparator
Granite Surface Plate ³ – (Local Flatness Only)	Up to 2500 mm x 1600 mm	0.22 µm/m + 0.70 µm	JIS B7513, electronic dimensional, comparator, repeat reading gage
Laser Scan Micrometer ³	5 mm 15 mm 30 mm 50 mm	0.35 µm 0.35 µm 0.35 µm 0.35 µm	Cylindrical masters class XXX
Depth Micrometer ³	152.4 mm interchangeable rods	1.5 µm	Depth micrometer calibrator
CMM Performance Verification ³ (Coordinate Measuring Machines) –			Calibration per ISO 10360 using:
Linear displacement (x, y, and z axis)	900 mm	1.2 µm/m + 0.47 µm	Step gage
Volumetric displacement	900 mm	2.0 µm/m + 0.77 µm	Master sphere

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage – Generate ³	(0 to 330) mV (0 to 3.3) V (0 to 33) V (30 to 330) V (100 to 1000) V	0.018 % + 8.3 µV 0.018 % + 1.2 µV 0.015 % + 3 mV 0.021 % + 2.6 mV 83 µV/V + 12 mV	Fluke 5500A

Parameter/Equipment	Range	CMC ^{2, 4, 5} (\pm)	Comments
DC Voltage – Measure, Fixed Points ³	200 mV 2 V 20 V 200 V 1000 V	0.22 μ V/V + 2 μ V 12 μ V/V + 2.2 μ V 12 μ V/V + 3.9 μ V 26 μ V/V + 460 μ V 26 μ V/V + 360 μ V	Keithley 2002
DC Current – Generate ³	(0 to 3.3) mA (0 to 33) mA (0 to 330) mA (0 to 2.2) A (0 to 11) A	13 μ A/A + 3.5 μ A 0.016 % + 3 μ A 0.023 % + 6 μ A 44 μ A/A + 4 mA 0.053 % + 3 mA	Fluke 5500A
DC Current – Measure, Fixed Points ³	200 μ A 2 mA 20 mA 200 mA 2 A 10 A	15 pA/A + 9 nA 0.04 % + 51 nA 0.04 % + 470 nA 0.043 % + 4.6 μ A 0.086 % + 46 mA 0.29 % + 2.6 mA	Keithley 2002 Fluke 45

Parameter/Range	Frequency	CMC ^{2, 4} (\pm)	Comments
AC Voltage – Generate ³ (1 to 33) 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	0.4 % + 25 μ V 0.17 % + 24 μ V 0.22 % + 24 μ V 0.28 % + 25 μ V 0.4 % + 40 μ V 1.1 % + 73 μ V	Fluke 5500A
(33 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	0.28 % + 67 μ V 0.06 % + 24 μ V 0.12 % + 24 μ V 0.18 % + 47 μ V 0.27 % + 200 μ V 0.8 % + 390 μ V	

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Voltage – Generate ³ (cont)			
330 mV 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	0.17 % + 0.4 μV 0.039 % + 0.07 mV 0.095 % + 0.07 mV 0.16 % + 0.4 mV 0.27 % + 2 mV 0.57 % + 4 mV	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	1.7 % + 4.2 mV 0.05 % + 0.8 mV 0.05 % + 0.8 mV 0.22 % + 6 mV 0.27 % + 20 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.06 % + 9 mV 0.09 % + 18 mV 0.1 % + 39 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.05 % + 106 mV 0.23 % + 120 mV 0.23 % + 580 mV	
AC Current – Generate ³			
(30 to 330) μA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) Hz	0.19 % + 635 nA 0.072 % + 657 nA 0.094 % + 671 nA 0.36 % + 608 nA 1.4 % + 456 nA 0.22 % + 0.56 μA	Fluke 5500A
330 μA to 3.3 mA	(20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.1 % + 0.64 μA 0.1 % + 0.61 μA 0.22 % + 0.58 μA 0.68 % + 0.46 μA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.23 % + 4.4 μA 0.12 % + 5 μA 0.1 % + 4 μA 0.23 % + 4 μA 0.69 % + 4 μA	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.32 % + 15 μA 0.23 % + 4.5 μA 0.23 % + 1.8 μA 0.31 % + 11 μA 0.71 % + 27 μA	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current – Generate ³ (cont)			
330 mA to 2.2 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.22 % + 0.58 mA 0.1 % + 0.66 mA 0.86 % + 0.43 mA	Fluke 5500A
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	0.06 % + 2.8 mA 0.12 % + 2.7 mA 0.38 % + 2.4 mA	

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
AC Voltage – Measure, Fixed Points ³	200 mV 2 V 20 V 200 V 750 V	0.025 % + 24 µV 0.023 % + 0.23 mV 0.034 % + 3.5 mV 0.034 % + 36 mV 0.035 % + 130 mV	Keithley 2002
AC Current – Measure, Fixed Points ³	200 µA 2 mA 20 mA 200 mA 2 A 10 A	5.8 µA/A + 26 nA 0.14 % + 0.35 µA 0.14 % + 3.5 µA 0.14 % + 35 µA 0.35 % + 0.35 mA 1.3 % + 11 mA	Keithley 2002 Fluke 45
Resistance – Measure, Fixed Points (4-wire) ³	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ	6.4 µΩ/Ω + 0.72 mΩ 18 µΩ/Ω + 1.4 mΩ 38 µΩ/Ω + 0.4 mΩ 13 µΩ/Ω + 9.1 mΩ 42 µΩ/Ω + 210 mΩ 78 µΩ/Ω + 1 Ω	Keithley 2002

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω 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 330 kΩ 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	0.014 % + 12 mΩ 0.014 % + 19 mΩ 0.011 % + 19 mΩ 0.025 % + 2.9 mΩ 92 μΩ/Ω + 0.09 Ω 0.026 % + 0.1 Ω 94 μΩ/Ω + 0.92 Ω 0.022 % + 0.91 Ω 0.012 % + 9.2 Ω 0.022 % + 13 Ω 0.017 % + 0.08 kΩ 0.023 % + 150 Ω 0.069 % + 0.74 kΩ 0.12 % + 1.2 kΩ 0.56 % + 20 kΩ 0.53 % + 220 kΩ	Fluke 5500A
Electrical Calibration of Thermocouple Indicators & Indicating Systems ³ –			
Type B	(600 to 1820) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.51 °C 0.40 °C 0.36 °C 0.40 °C	Fluke 5500A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.39 °C 0.35 °C 0.37 °C 0.58 °C 0.98 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.60 °C 0.25 °C 0.24 °C 0.20 °C 0.25 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.36 °C 0.25 °C 0.24 °C 0.26 °C 0.32 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.42 °C 0.27 °C 0.25 °C 0.35 °C 0.47 °C	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Calibration of Thermocouple Indicators & Indicating Systems ³ (cont) –			
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.46 °C 0.35 °C 0.26 °C	Fluke 5500A
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.49 °C 0.31 °C 0.28 °C 0.27 °C 0.36 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.68 °C 0.44 °C 0.42 °C 0.47 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.57 °C 0.45 °C 0.44 °C 0.54 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.75 °C 0.33 °C 0.25 °C 0.24 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.67 °C 0.36 °C	
High Voltage – Measure ³			
AC Voltage @ 60 Hz	0 to 40 kV	59 V/kV + 0.6 V	Fluke 289 High voltage probe, Fluke 80K-40
DC Voltage	0 to 20 kV 20 to 35 kV 35 to 40 kV	23 V/kV + 2.8 V 12 V/kV + 11 V 24 V/kV + 3.8 V	
High Current – Measure ³			
AC Current, Fixed Points @ 60 Hz	30 A 300 A 3000 A	10 mA/A + 1.3 A 25 mA/A + 0.8 A 23 mA/A + 1.4 A	Fluke 45, AC current clamp Fluke 13000S
DC Current	(0 to 600) A	23 mA/A + 0.6 A	Fluke 336

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Calibration of RTD Indicators & Indicating Systems ³ –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.09 °C 0.09 °C 0.10 °C 0.12 °C 0.13 °C 0.15 °C 0.27 °C	Fluke 5500A
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.09 °C 0.09 °C 0.11 °C 0.12 °C 0.13 °C 0.15 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.30 °C 0.08 °C 0.09 °C 0.10 °C 0.11 °C 0.11 °C 0.12 °C 0.13 °C 0.27 °C	
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.08 °C 0.08 °C 0.08 °C 0.09 °C 0.15 °C 0.16 °C 0.18 °C 0.20 °C	
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.08 °C 0.08 °C 0.09 °C 0.10 °C 0.11 °C 0.11 °C 0.12 °C 0.13 °C	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Electrical Calibration of RTD Indicators & Indicating Systems ³ (cont) –			
Pt 385, 1000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.08 °C 0.08 °C 0.08 °C 0.09 °C 0.10 °C 0.10 °C 0.11 °C 0.27 °C	Fluke 724
PtNi 385, 120 Ω	(0 to 100) °C (-80 to 0) °C (100 to 260) °C	0.12 °C 0.12 °C 0.18 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.36 °C	
Ni 120	-80 °C to 260 °C	0.29 °C	
Pt 100-385	-200 °C to 800 °C	0.46 °C	
Pt 100-392	-200 °C to 630 °C	0.43 °C	
Pt 100-JIS	-200 °C to 630 °C	0.43 °C	
Pt 200-385	-200 °C to 250 °C	0.28 °C	
	250 °C to 630 °C	0.94 °C	
Pt 500-385	-200 °C to 500 °C	0.38 °C	
	500 °C to 630 °C	0.49 °C	
Pt 1000-385	-200 °C to 630 °C	0.32 °C	
Capacitance – Generate ³	(0.33 to 10.999) nF (11 to 109.99) nF (110 to 329.99) nF (0.33 to 1.0999) μF (1.1 to 3.2999) μF (3.3 to 10.999) μF (11 to 32.999) μF (33 to 109.99) μF (110 to 329.99) μF (330 to 1.1) mF	0.8 % + 13 pF 0.6 % + 110 pF 0.23 % + 660 pF 0.27 % + 1.4 nF 0.44 % + 3.3 nF 0.7 % + 4 nF 0.4 % + 60 nF 0.8 % + 68 nF 0.76 % + 570 nF 1.1 % + 1.3 μF	Fluke 5500A
Sound Level Meter ³	94/114 db to 250 Hz 94/114 db to 1000 Hz	0.68 dB 0.68 dB	Quest Technologies calibrator QC-2A
Inductance ³	Up to 9.999 H	2.3 % + 0.6 mH	Inductance master IET LS-400

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Megohmmeter – DC Voltage ³ (250, 500, 1000) V	100 kΩ to 11.1 GΩ	2.3 % + 0.6 MΩ	High resistance decade substituter IET HRRS-F-5-100K
Current Clamp Meter ³ – AC Current (45 to 65) Hz (65 to 440) Hz DC Current	Up to 550 A Up to 550 A	0.4 % + 0.11 A 0.45 % + 0.13 A 0.4 % + 73 mA	Fluke 5500A w/coil
Oscilloscope Calibration ³ – Amplitude Squarewave 1 MΩ Load 50 Ω Load DC 1 MΩ Load 50 Ω Load Flatness @ 50 Ω – 50 kHz to 100 MHz (100 to 250) MHz Time Marker @ 50 Ω Load Rise Time – 1 kHz to 1 MHz @ 50 Ω 4.5 mV to 2.75 V	1.8 mV to 105 V _{pk-pk} 1.8 mV to 2.2 V _{pk-pk} (0 to 33) V (0 to 2.2) V 5 mV to 5.5 V 2 ns to 1 μs 2 μs to 50 μs 100 μs to 5 s ≤ 400 ps	1.2 % + 1 μV 56 μV/V + 120 μV 0.018 % + 71 μV 0.02 % + 67 μV 1.1 % + 1 mV 1.2 % + 1 mV 6.2 % + 45 ps 4.9 % + 26 ns 2.1 % + 25 μs 1.2 ns	Fluke 5500A w/SC300

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Power Meter Calibration ³ –			
DC @ (11 & 1020) V	(3.3 to 8.99) mA (9 to 32.999) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 11) A	0.028 % + 2.9 mW 0.03 % + 2 mW 0.044 % + 2.3 mW 0.17 % + 1.1 mW 0.015 % + 3.5 mW 0.2 μW/W + 3 mW 0.11 % + 2.3 mW 0.1 % + 1.6 mW	Fluke 5500A
AC: @ (45 to 65) Hz (33 to 329.999) mV	(3.3 to 8.99) mA (9 to 32.999) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 11) A	2.8 nW/W + 3 μW 2.4 nW/W + 2 μW 2.2 nW/W + 7 μW 2.9 nW/W + 0.2 μW 4 nW/W + 0.3 μW 2.9 nW/W + 1.2 μW 3.8 nW/W + 88 μW 2.8 nW/W + 2.4 μW	
330 mV to 1020 V	(3.3 to 8.99) mA (9 to 32.999) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 11) A	2.8 μW/W + 0.9 mW 1.7 μW/W + 0.4 mW 2.9 nW/W + 0.4 mW 0.17 % + 0.1 mW 1.3 μW/W + 3.2 mW 1 μW/W + 3 mW 0.21 % + 1.5 mW 0.16 % + 1 mW	

IV. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Pressure ³ –			
Gages	Up to 25 inH ₂ O Up to 200 inH ₂ O Up to 60 psi Up to 1500 psi Up to 5000 psi	0.038 inH ₂ O 0.21 inH ₂ O 0.08 psi 1.1 psi 5.9 psi	HEISE Dresser PTE-1, differential pressure module HQS-1
Transducers	(4 to 20) mA	0.010 mA	

Parameter/Equipment	Range	CMC ² (±)	Comments
Force Gage ³	Up to 370 lbf	0.0003 lbf/lbf + 0.003 lbf	Class M2 weight
	500 to 5,000 lbf	0.0011 lbf/lbf + 0.32 lbf	Load Cell
	10,000 to 100,000 lbf	0.0015 lbf/lbf + 2.3 lbf	
	30,000 to 300,000 lbf	0.0015 lbf/lbf + 7.5 lbf	
Vacuum Gages ³	(0 to 29) in Hg	0.027 in Hg	HEISE Dresser PTE-1, differential pressure module HQS-2
Indirect Verification of Rockwell Hardness Testers (Mean Hardness Values Only) ³	HRBW: Low	0.71 HRBW	Indirect verification per ASTM E18
	Middle	0.71 HRBW	
	High	0.60 HRBW	
	HRC: Low	0.42 HRC	
	Middle	0.41 HRC	
	High	0.37 HRC	
	HR15N: Low	0.50 HR15N	
	Middle	0.66 HR15N	
	High	0.42 HR15N	
	HR30N: Low	0.66 HR30N	
	Middle	0.60 HR30N	
	High	0.51 HR30N	
HR45N: Low	0.60 HR45N		
Middle	0.59 HR45N		
High	0.52 HR45N		
HR15TW: Low	0.69 HR15TW		
Middle	0.65 HR15TW		
High	0.44 HR15TW		
HR30TW: Low	0.59 HR30TW		
Middle	0.51 HR30TW		
High	0.46 HR30TW		

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Indirect Verification of Rockwell Hardness Testers (Mean Hardness Values Only) ³ (cont)	HR45TW: Low Middle High	0.59 HR45TW 0.58 HR45TW 0.59 HR45TW	Indirect verification per ASTM E18
Indirect Verification of Microindentation Hardness Testers ³ :	Repeatability under Forces P(gf): 500 ≤ P ≤ 1000		Indirect verification per ASTM E384. Uncertainty is stated as a percentage of the standardized test block hardness value.
Knoop	100 ≤ HK ≤ 250 250 ≤ HK ≤ 650	1.1 % 1.1 %	
Vickers	100 ≤ HV ≤ 240 240 ≤ HV ≤ 600	0.82 % 0.82 %	
Knoop and Vickers (100 g Load)	Repeatability under Forces P(gf): 10 ≤ P ≤ 500 HK > 650 HV > 600	1.1 % 0.93 %	
Indirect Verification of Brinell Hardness Testers at Test Condition(s) ³ :			Indirect verification method per ASTM E10
10/3000/10	(100 to 200) HBW (300 to 400) HBW (500 to 600) HBW	0.98 HBW 2.34 HBW 5.18 HBW	
5/250/10	(40 to 80) HBW (100 to 140) HBW (160 to 200) HBW	0.41 HBW 0.50 HBW 1.3 HBW	
Scales & Balances ³	1 mg to 210 g (210 to 610) g (610 to 1600) g Up to 11 kg Up to 500 kg	0.5 µg/g + 0.01 mg 0.1 µg/g + 0.79 mg 0.7 µg/g + 7.0 mg 0.9 µg/g + 72 mg 74 g	Class E2 Class E2 Class E2 Class M2 Class M2

Parameter/Equipment	Range	CMC ² (±)	Comments
Torque ³ – Wrenches Analyzers, Transducers	(25 to 250) in·lb	0.005 in·lb/in·lb + 0.43 in·lb	Mountz torque analyzer
	(25 to 250) ft·lb	0.0043 ft·lb/ft·lb + 0.8 ft·lb	
	(250 to 1000) ft·lb	0.0042 ft·lb/ft·lb + 1.1 ft·lb	Weights M2
	Up to 250 lb·in	0.0042 in·lb/in·lb + 0.07 in·lb	
	Up to 250 lb·ft	0.0023 lb·ft/lb·ft + 0.01 lb·ft	
	Up to 750 lb·ft	0.0037 lb·ft/lb·ft + 0.33 lb·ft	Torque arms with Class M2 weights,
	Up to 250 lb·in	0.002 in·lb/in·lb + 0.025 in·lb	
	Up to 250 lb·ft	0.002 lb·ft/lb·ft + 0.003 lb·ft	
	Up to 500 lb·ft	0.002 lb·ft/lb·ft + 0.02 lb·ft	

V. Thermodynamic

Parameter/Equipment	Range	CMC ² (±)	Comments
Infrared Temperature – Measuring Equipment	(50 to 100) °C (100 to 300) °C (300 to 500) °C	16 μ°C/°C + 0.6 °C 0.001°C/°C + 0.5 °C 0.001°C/°C + 0.45 °C	Hart Calibrator 9132

VI. Time and Frequency

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Stopwatch – Time	Up to 0 h 59 m 59 s	5 μs/s + 0.23 s	Direct comparison to stopwatch
Frequency – Measure	DC to 225 MHz	2.9 % + 130 mHz	Agilent 53131A Universal counter,
	30 Hz to 300 MHz	2.9 % + 1.1 Hz	Tektronix TDS3052B oscilloscope

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Frequency – Measuring Equipment	(0 to 11999) Hz (12 to 2000) kHz (2 to 300) MHz	56 µHz/Hz + 5.3 mHz 0.029 % + 2.3 Hz 15 µHz/Hz + 6 kHz	Fluke 5500A

¹ This laboratory offers commercial calibration and field calibration service.

² Calibration and Measurement Capability (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

³ Field calibration service is available for this calibration and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

⁴ The measurands stated are generated with the Fluke 5550A or 45 series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a fraction/percentage of the reading plus a fixed floor specification.

⁵ In the statement of CMC, percentage refers to percent of reading unless otherwise noted.



World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

METROLOGIA MONTERREY, S.A. DE C.V.

Nuevo Leon, Mexico

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 16th day of August 2011.



A handwritten signature in black ink, reading "Peter Abney".

President & CEO
For the Accreditation Council
Certificate Number 1572.01
Valid to June 30, 2013

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.