



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

PHOENIX CALIBRATION
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CALIBRATION

Valid To: October 31, 2018

Certificate Number: 3022.01

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

I. Acoustical Quantities

Parameter/Range	Frequency	CMC ² (±)	Comments
Sound Level ³ (74 to 114) dB	(0.125 to 2) kHz (>2 to 4) kHz	0.18 dB 0.31 dB	Sound level calibrator
Acoustical Calibrator ³ (74 to 114) dB	(0.125 to 2) kHz (>2 to 4) kHz	0.20 dB 0.32 dB	Sound level meter

II. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
Conductivity – Fixed Points ³	1 µS/cm 9 µS/cm 25 µS/cm 50 µS/cm 100 µS/cm 147 µS/cm 1410 µS/cm 10 mS/cm 150 mS/cm	0.35 µS/cm 0.20 µS/cm 0.40 µS/cm 0.77 µS/cm 0.42 µS/cm 2.6 µS/cm 22 µS/cm 26 µS/cm 280 µS/cm	Conductivity standard solution

Parameter/Equipment	Range	CMC ² (±)	Comments
pH ³ – Fixed Points	4.00 pH 7.00 pH 10.00 pH	0.13 pH 0.13 pH 0.13 pH	pH buffer solution
pH (mV Simulation)	(4.00 to 10.00) pH	0.0058 pH	Multifunction calibrator
TDS ³	0.6 ppm 6 ppm 65 ppm 6650 ppm 100 000 ppm	0.22 ppm 0.20 ppm 0.29 ppm 20 ppm 190 ppm	TDS solution

III. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Gage Blocks	(0.050 to 4) in (>4 to 6) in (>6 to 20) in	3.2 μin + 0.8 μin/in 4.3 μin + 0.99 μin/in 9.5 μin + 1.1 μin/in	Gage blocks
Pin Gages	(0.0115 to 0.75) in	11 μin + 6.8 μin/in	Laser micrometer and master pin gages
Calipers ³	Up to 24 in	170 μin + 22 μin/in	Gage blocks
Micrometers ³	Up to 24 in	33 μin + 25 μin/in	Gage blocks
Dial Indicators ³	Up to 8 in	33 μin + 1.2 μin/in	Gage blocks
Surface Plate Flatness ³	Up to 60 in x 60 in	97 μin	Granite plane-kator-grade AA
Rulers & Tapes	Up to 48 in	0.0061 in + 0.000 002 5 in/in	Gage blocks
Sieves	(0.020 to 125) mm	0.0015 mm	Measuring microscope

IV. Dimensional Testing⁶

Parameter/Equipment	Range	CMC ² (±)	Comments
1D Dimensional Testing – Length Radius	Up to 4 in (4 to 8) in (8 to 24) in Up to 4 in (4 to 8) in (8 to 24) in	41 uin 600 uin + 22 uin/in 0.023 in + 22 uin/in 41 uin 600 uin + 22 uin/in 0.023 in + 22 uin/in	Measuring microscope Digital caliper
Luer Gauges – Conical Fitting Diameter & Length	(0 to 25) mm (25 to 50) mm	0.000 89 mm 0.000 92 mm	Measuring microscope ISO 594/1 and ISO 594/2

V. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
DC Current – Generate ³	(0 to 220) µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 10) A (10 to 20) A	0.0069 µA + 47 µA/A 0.016 µA + 40 µA/A 0.015 µA + 40 µA/A 1.5 µA + 52 µA/A 27 µA + 92 µA/A 710 µA + 420 µA/A 640 µA + 460 µA/A	Multifunction calibrator Multifunction calibrator with transconductance amplifier
DC Current – Measure ³	(0 to 10) µA (10 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1.1 to 11) A (11 to 1500) A	0.0069 µA + 56 µA/A 0.007 µA + 52 µA/A 0.0081 µA + 47 µA/A 0.051 µA + 47 µA/A 0.84 µA + 66 µA/A 14 µA + 160 µA/A 11 µA + 590 µA/A 500 µA + 150 µA/A	8.5 digit digital multimeter 8.5 digit multimeter with current shunt



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Capacitance – Generate ³ , 1 kHz	(0.0001 to 0.5) nF (0.0005 to 1.5) μF (1.5 to 10) μF (10 to 100) μF (0.1 to 50) mF (50 to 400) mF	0.31 pF 0.12 nF 0.91 nF 5.3 nF 0.46 mF 0.84 mF	Standard capacitors
Capacitance – Measure ³ , 1 kHz	(0 to 0.5) nF (0.0005 to 1.5) μF (1.5 to 10) μF (10 to 100) μF (0.1 to 50) mF (50 to 100) mF	0.32 pF 0.16 pF 0.0047 μF 0.067 μF 0.46 mF 0.84 mF	Precision LCR meter
Inductance – Generate ³ , 100 kHz and 1 kHz	(1 to 5) mH (5 to 10) mH (10 to 50) mH (50 to 100) mH (100 to 1000) mH (1 to 10) H	3.8 μH + 0.21 mH/H 0.88 μH + 0.7 mH/H 9.6 μH + 44 μH/H 6.3 μH + 160 μH/H 0.018 mH + 0.27 mH/H 0.0016 H + 0.061 H/H	Decade inductor
Inductance - Measure ³ , 100 kHz and 1 kHz	(1 to 100) μH (0.1 to 100) mH (0.1 to 1) H	0.1 μH + 3.1 mH/H 82 pH + 0.21 mH/H 0.22 mH + 0.92 mH/H	Precision LCR meter
Electrical Calibration of Thermocouple Indicators – Generate ³			
Type B	600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1820 °C	1.2 °C 0.98 °C 0.94 °C	Thermocouple simulator
Type C	0 °C to 800 °C 800 °C to 1200 °C 1200 °C to 1800 °C 1800 °C to 2316 °C	0.72 °C 0.84 °C 1.1 °C 1.5 °C	
Type E	-250 °C to -200 °C -200 °C to -100 °C -100 °C to 600 °C 600 °C to 1000 °C	0.7 °C 0.36 °C 0.36 °C 0.25 °C	
Type J	-210 °C to -100 °C -100 °C to 800 °C 800 °C to 1200 °C	0.5 °C 0.25 °C 0.25 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Indicators – Generate ³ (cont)			
Type K	-200 °C to -100 °C -100 °C to 400 °C 400 °C to 1200 °C 1200 °C to 1372 °C	0.47 °C 0.36 °C 0.36 °C 0.42 °C	Thermocouple simulator
Type L	-200 °C to -100 °C -100 °C to 800 °C 800 °C to 900 °C	0.41 °C 0.41 °C 0.32 °C	
Type N	-200 °C to -100 °C -100 °C to 900 °C 900 °C to 1300 °C	0.7 °C 0.58 °C 0.36 °C	
Type R	-20 °C to 0 °C 0 °C to 100 °C 100 °C to 1767 °C	1.4 °C 1.3 °C 1.1 °C	
Type S	-20 °C to 0 °C 0 °C to 200 °C 200 °C to 1400 °C 1400 °C to 1767 °C	1.4 °C 1.3 °C 1.1 °C 1.2 °C	
Type T	-250 °C to -200 °C -200 °C to 0 °C 0 °C to 400 °C	1.1 °C 0.47 °C 0.36 °C	
Type U	-200 °C to 0 °C 0 °C to 600 °C	0.51 °C 0.39 °C	
Electrical Calibration of Thermocouple Simulators – Measure ³			
Type B	600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1820 °C	0.6 °C 0.82 °C 0.82 °C	Process calibrator or millivolt meter
Type C	0 °C to 800 °C 800 °C to 1200 °C 1200 °C to 1800 °C 1800 °C to 2316 °C	0.71 °C 0.93 °C 1.3 °C 2.3 °C	
Type E	-250 °C to -200 °C -200 °C to -100 °C -100 °C to 600 °C 600 °C to 1000 °C	1.5 °C 0.59 °C 0.59 °C 0.48 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Simulators – Measure ³ (cont)			
Type J	-210 °C to -100 °C -100 °C to 800 °C 800 °C to 1200 °C	0.7 °C 0.37 °C 0.6 °C	Process calibrator or millivolt meter
Type K	-200 °C to -100 °C -100 °C to 400 °C 400 °C to 1200 °C 1200 °C to 1372 °C	0.82 °C 0.37 °C 0.59 °C 0.82 °C	
Type L	-200 °C to -100 °C -100 °C to 800 °C 800 °C to 900 °C	0.7 °C 0.75 °C 0.26 °C	
Type N	-200 °C to -100 °C -100 °C to 900 °C 900 °C to 1300 °C	1.2 °C 0.59 °C 0.7 °C	
Type R	-20 °C to 0 °C 0 °C to 100 °C 100 °C to 1767 °C	2.7 °C 1.7 °C 1.2 °C	
Type S	-20 °C to 0 °C 0 °C to 200 °C 200 °C to 1400 °C 1400 °C to 1767 °C	2.7 °C 1.7 °C 1.0 °C 1.3 °C	
Type T	-250 °C to -200 °C -200 °C to 0 °C 0 °C to 400 °C	2.0 °C 0.71 °C 0.36 °C	
Type U	-200 °C to 0 °C 0 °C to 600 °C	0.7 °C 0.37 °C	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current – Generate ³			
(0 to 20) µA	(0.1 to 1) kHz (1 to 5) kHz	9.2 µA + 140 µA/A 0.014 µA + 320 µA/A	Multifunction calibrator
(20 to 220) µA	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.011 µA + 140 µA/A 0.021 µA + 320 µA/A 0.11 µA + 1300 µA/A	

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Current – Generate ³ (cont)			
(0.22 to 2.2) mA	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.061 μA + 140 μA/A 0.17 μA + 230 μA/A 0.84 μA + 1300 μA/A	Multifunction calibrator
(2.2 to 22) mA	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.61 μA + 140 μA/A 1.7 μA + 230 μA/A 8.1 μA + 1300 μA/A	
(22 to 220) mA	(40 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz (5 to 10) kHz	8.6 μA + 140 μA/A 8.5 μA + 140 μA/A 17 μA + 230 μA/A 58 μA + 1300 μA/A	
(0.22 to 2.2) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	100 μA + 300 μA/A 270 μA + 870 μA/A 0.97 mA + 8.1 mA/A	
(2.2 to 20) A	40 Hz to 1 kHz	58 mA + 1.1 mA/A	Multifunction calibrator with transconductance amplifier
AC Current – Measure ³			
(0 to 100) μA	40 Hz to 1 kHz	0.035 μA + 0.69 mA/A	8.5 digit digital multimeter
(0.1 to 1) mA	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.23 μA + 0.35 mA/A 0.24 μA + 3.5 mA/A 0.31 μA + 0.69 mA/A	
(1 to 10) mA	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	2.3 μA + 0.35 mA/A 2.4 μA + 0.35 mA/A 3.7 μA + 6.9 mA/A	
(10 to 100) mA	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 mA + 0.35 mA/A 0.025 mA + 0.35 mA/A 0.039 mA + 0.69 mA/A	
(0.1 to 1.05) A	(0.04 to 5) kHz (5 to 10) kHz	0.24 mA + 1.2 mA/A 0.95 mA + 3.5 mA/A	8.5 digit digital multimeter with current shunt
(1.05 to 10) A	40 Hz to 1 kHz	1.2 mA + 0.081 mA/A	
(10 to 50) A	40 Hz to 1 kHz	5.9 μA + 0.081 mA/A	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current – Measure ³ (cont)			
(50 to 100) A	40 Hz to 1 kHz	0.012 mA + 0.081 mA/A	8.5 digit digital multimeter with current shunt
(100 to 1000) A	40 Hz to 1 kHz	0.032 mA + 0.081 mA/A	
AC Voltage – Generate ³			Multifunction calibrator
(0 to 2.2) mV	(0.04 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	8.1 μV + 980 μV/V 15 μV + 1300 μV/V 29 μV + 3900 μV/V	
(2.2 to 22) mV	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	5.9 μV + 120 μV/V 8.6 μV + 980 μV/V 15 μV + 1300 μV/V 31 μV + 3900 μV/V	
(22 to 220) mV	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	10 μV + 120 μV/V 30 μV + 980 μV/V 35 μV + 1300 μV/V 67 μV + 1300 μV/V	
(0.22 to 0.5) V	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	0.58 mV + 0.087 mV/V 0.035 mV + 0.98 mV/V 0.049 mV + 1.3 mV/V 1.1 mV + 2.5 V/V	
(0.5 to 1) V	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	0.58 mV + 0.087 mV/V 0.58 mV + 0.29 mV/V 0.59 mV + 0.5 mV/V 1.2 mV + 2.5 mV/V	
(1 to 2) V	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	0.58 mV + 0.087 mV/V 0.58 mV + 0.29 mV/V 0.6 mV + 0.39 mV/V 1.2 mV + 2.5 mV/V	
(2 to 3) V	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	5.8 mV + 0.087 mV/V 5.8 mV + 0.29 mV/V 6.0 mV + 0.58 mV/V 11 mV + 3.1 mV/V	
(3 to 10) V	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	5.8 mV + 0.087 mV/V 5.8 mV + 0.29 mV/V 6.1 mV + 0.58 mV/V 12 mV + 3.1 mV/V	



Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Voltage – Generate ³ (cont)			
(10 to 20) V	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	5.8 mV + 0.087 mV/V 5.8 mV + 0.29 mV/V 6.1 mV + 0.58 mV/V 13 mV + 3.1 mV/V	Multifunction calibrator
(20 to 30) V	(0.04 to 20) kHz (20 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	58 mV + 0.092 mV/V 58 mV + 0.058 mV/V 120 mV + 1.7 mV/ V 230 mV + 1.3 mV/ V	
(30 to 100) V	(0.04 to 20) kHz (20 to 100) kHz	58 mV + 0.092 mV/V 59 mV + 0.058 mV/V	
(100 to 200) V	(0.04 to 20) kHz (20 to 100) kHz	58 mV + 0.092 mV/V 59 mV + 0.058 mV/V	
(200 to 500) V	(40 to 50) Hz (0.05 to 1) kHz	59 mV + 0.046 mV/V 85 mV + 0.092 mV/V	
(500 to 1000) V	(0.05 to 1) kHz	18 mV + 0.092 mV/V	
(1.0 to 40) kV	60 Hz	0.006 kV + 0.002 kV/kV	
AC Voltage – Measure ³			
(1 to 10) mV	10 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	1.6 μV + 0.23 mV/V 4.4 μV + 0.35 mV/V 4.6 μV + 4.1 mV/V 35 μV + 4.6 mV/V 71 μV + 4.6 mV/V	8.5 digit digital multimeter
(10 to 100) mV	10 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	5.3 μV + 81 μV/V 4.2 μV + 0.16 mV/V 18 μV + 0.92 mV/V 44 μV + 3.5 mV/V 71 μV + 12 mV/V	
100 mV to 1 V	10 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.58 mV + 81 μV/V 0.61 mV + 0.16 mV/V 0.59 mV + 0.92 mV/V 0.67 mV + 3.5 mV/V 2.9 mV + 1.2 mV/V	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Measure ³ (cont)			
(1 to 10) V	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.67 mV + 81 μV/V 5.8 mV + 0.16 mV/V 5.8 mV + 0.35 mV/V 5.9 mV + 0.92 mV/V 6 mV + 3.5 mV/V 100 mV + 12 mV/V	8.5 digit digital multimeter
(10 to 100) V	(0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz	58 mV + 0.23 mV/V 12 mV + 0.23 mV/V 63 mV + 1.4 mV/V	
(100 to 750) V	(0.04 to 1) kHz (1 to 20) kHz	62 mV + 0.46 mV/V 56 mV + 6.9 mV/V	
(750 to 1000) V	(0.04 to 1) kHz	130 mV + 0.48 mV/V	6.5 digit multimeter
(1 to 40) kV	(50/60) Hz	0.006 kV + 0.002 kV/kV	8.5 digit digital multimeter/high voltage probe
AC Current – Generate, Clamp-On Ammeters Toroidal ³	(11 to 550) A (550 to 1000) A	0.61 mA + 0.53 mA/A 30 mA + 0.68 mA/A	Multifunction calibrator /transconductance amplifier/standard coil
AC Current – Measure, Clamp-On Ammeters Toroidal ³	(11 to 550) A (550 to 1000) A	0.61 mA + 0.53 mA/A 30 mA + 0.68 mA/A	8.5 digit digital multimeter / current shunt
Oscilloscopes ³ –			
Amplitude - (Up to 10) kHz	(Up to 120) V _{p-p}	1.9 mV _{p-p} + 0.23 mV _{p-p} /V _{p-p}	Multifunction calibrator
Frequency Sweep	(10 to 500) MHz	0.12 mHz + 1 μHz/Hz	
Time Base	(5 to 50.00) Mhz	0.12 mHz + 1 μHz/Hz	
Bandwidth Level (0.1 to 1) V	(10 to 500) Mhz	1.2 dB + 0.000 072 dB/dB	

VI. Fluid Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
Flow – Gas (Air) ³	(0 to 6000) ccm	0.12 sccm + 0.013 sccm/sccm	Air flow bubble generator
	(6000 to 30 000) ccm	1.2 sccm + 0.012 sccm/sccm	Mass flowmeter
	(30 to 200) SLPM	0.013 slpm + 0.024 slpm/slpm	
	(100 to 2000) cfm	1.2 scfm + 0.036 scfm/scfm	AirData multimeter
Flow – Liquid ³	(30 to 350) L/min	0.03 LPM + 0.004 LPM/LPM	Coriolis mass flow meter
Pipettes and Burettes	Up to 500 µL (>0.5 to 20) mL (>20 to 200) mL (>200 to 1000) mL (>1000 to 10 000) mL	0.0012 µL + 0.000 38 µL/L 0.0042 µL + 0.000 21 µL/L 0.0037 µL + 0.000 33 µL/L 0.24 µL + 0.0005 µL/L 3.1 µL + 0.0004 µL/L	Gravimetric record reference to mass balances and mass standards
Volumetric Ware/ Equipment	(0 to 2500) mL	0.09 µL	Gravimetric record reference to mass balances and mass standards
	(1 to 5) gal	38 µL + 0.0004 µL/L	
	(5 to 50) gal (50 to 100) gal	360 µL + 0.000 56 µL/L 620 µL + 0.0004 µL/L	
Hydrometry – Specific Gravity (Relative Density) Hydrometers and Equivalent Values in Other Hydrometer Scales ³ : Density (Kg/m ³ , Kg/L) Baume Brix Proof	(0.60 to 0.70) SG (0.70 to 1.00) SG (1.00 to 2.00) SG	0.000 21 SG 0.000 31 SG 0.0006 SG	ASTM E126

Parameter/Equipment	Range	CMC ² (±)	Comments
Turbidity ³	<0.04 NTU <0.1 NTU 10 NTU 20 NTU 100 NTU 800 NTU 2000 NTU 4000 NTU	0.042 NTU 0.1 NTU 0.4 NTU 2.0 NTU 5.0 NTU 40 NTU 31 NTU 61 NTU	Stabilized Formazin turbidity standard
Viscosity ³ – Fixed Points	30 cp 55cp 100 cp 500 cp 6000 cp 10 000 cp 22 000 cp	0.072 cp 0.11 cp 0.23 cp 0.24 cp 9 cp 20 cp 37 cp	Viscosity standard fluid

VII. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Durometer ³ – Types: A, B, C, D, DO, E, M, O, OO, OOO, OOO-S, R			ASTM D2240
Spring Calibration – Force	(0 to 100) DP	0.12 DP	
Indenter Extension and Shape –			
Diameter	Up to 0.5 in	42 µin	
Radius	(0.01 to 0.5) in	42 µin	
Angle	20° to 45°	0.000 61°	
Extension	Up to 0.5 in	42 µin	
Indenter Display	Up to 0.2 in	580 µin	

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³	HRC: Low Medium High HRBW: Low Medium High HR30N: Low Medium High	0.49 HRC 0.37 HRC 0.48 HRC 0.63 HRC 0.5 HRC 0.39 HRC 0.74 HRC 0.67 HRC 0.66 HRC	Indirect verification per ASTM E18
Balances ³	(1 to 500) mg 500 mg to 10 g (10 to 100) g (100 to 500) g (500 to 1000) g (1 to 25) kg	0.0016 mg + 0.81 µg/g 0.0039 mg + 0.45 µg/g 0.01 mg + 0.36 µg/g 0.063 mg + 0.49 µg/g 0.09 mg + 0.4 µg/g 1.5 mg + 0.59 µg/g	Standards weights
Scales ³	(1 to 5) kg (5 to 10) kg (10 to 25) kg	5.9 mg 7.1 mg 5.8 g	Standards weights
High Capacity Scale ³ – Test Weight ⁵ Test Load Electrical Verification of Display Scaling	 (25 to 500) kg (500 to 15 000) kg (15 000 to 60 000) kg (0 to 100 000) kg	 63 g + 1.4 g/25 kg 5.8 kg + 58 g/500 kg A + N(S) 9 kg + 0.058 g/kg	 Standards weights A = applied test weights CMC N = substitutions qty (N<=3) S = substitution test weights CMC Process meter
Velocity – Measure ³	(5.0000 to 10 000) rpm (10 000 to 100 000) rpm (100 000 to 500 000) rpm	0.06 rpm 0.016 rpm 0.73 rpm	Optical/contact tachometer

Parameter/Equipment	Range	CMC ² (±)	Comments
Velocity – Measuring Equipment ³	(0 to 1000) rpm (1000 to 10 000) rpm (10 000 to 50 000) rpm (50 000 to 100 000) rpm	0.078 rpm 0.078 rpm 0.58 rpm 0.9 rpm	Standard strobe
Torque Analyzers/ Testers ³	(2.5 to 25) in·lbf (25 to 250) in·lbf (250 to 12 000) in·lbf	0.0097 in·lbf + 5.8 μin·lbf/in·lbf 0.085 in·lbf + 5.8 μin·lbf/in·lbf 0.82 in·lbf + 0.0017 in·lbf/in·lbf	Torque wheel/mass standards
Torque Tools ³	(2.5 to 250) in·lbf (250 to 500) in·lbf (500 to 1000) in·lbf (1000 to 12 000) in·lbf	1.6 in·lbf 2.4 in·lbf 2.4 in·lbf 16 in·lbf	Torque analyzers
Force ³ – Tension Compression	 (0 to 1000) lbf (1000 to 10 000) lbf (10 000 to 100 000) lbf (0 to 1000) lbf (1000 to 10 000) lbf (10 000 to 100 000) lbf (100 000 to 500 000) lbf	 0.51 lbf + 0.17 mlf/lbf 0.82 lbf + 0.6 mlf/lbf 13 lbf 0.51 lbf + 0.0017 lbf/lbf 0.82 lbf + 0.0006 lbf/lbf 8.2 lbf + 0.0004 lbf/lbf 82 lbf + 0.0005 lbf/lbf	Standard load cells
Pressure and Vacuum ³	(0 to 1) in·H ₂ O (1 to 2) in·H ₂ O (2 to 4) in·H ₂ O (4 to 5) in·H ₂ O (-13 to 0) psi (0 to 0.029) psi (0.20 to 6.28) psi (6.28 to 14.5) psi (14.5 to 3000) psi (3000 to 10 000) psi (10 000 to 36 000) psi	0.000 01 in·H ₂ O 0.000 065 in·H ₂ O 0.000 26 in·H ₂ O 0.000 32 in·H ₂ O 0.0064 psi 0.0013 psi + 0.001 psi/psi 0.0058 psi + 0.000 16 psi/psi 0.006 psi 0.0038 psi + 0.000 16 psi 0.58 psi + 0.000 13 psi/psi 1.3 psi + 0.0081 psi/psi	Dead weight testers and pressure calibrators

Parameter/Equipment	Range	CMC ² (±)	Comments
Weights, Including Laboratory Weights and Masses: ASTM Classes 1, 2, 3, 4, 5, 6 & 7, OIML Classes E2, F1, F2, M1, M2 & M3	(1 to 10) mg	0.0013 mg	Methods: NIST weighing designs, standard operating procedures using standard weights, mass comparators
	(10 to 500) mg	0.0019 mg	
	1 g	0.0047 mg	
	2 g	0.0048 mg	
	5 g	0.0053 mg	
	10 g	0.0069 mg	
	20 g	0.0092 mg	
	50 g	0.020 mg	
	100 g	0.038 mg	
	200 g	0.078 mg	
	500 g	0.18 mg	
	1 kg	0.44 mg	
	2 kg	2.0 mg	
	5 kg	2.7 mg	
	10 kg	5.3 mg	
	25 kg	29 mg	
	500 kg	580 mg	

VIII. Optical Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
Color ³	(0 to 0.17) mg/L (0.18 to 0.46) mg/L (0.47 to 0.66) mg/L	0.05 mg/L 0.06 mg/L 0.07 mg/L	Color standard
Illuminance ³	(4 to 99 990) Fc	0.11 fc + 0.017 fc/fc	Light meter
Polarimeter ³ – 10.818° to 46.736° Rotation	(325 to 633) nm	0.0061°	Quartz control plate
Refraction ³	1.332 961 nD 1.347 88 nD 1.381 19 nD 1.420 60 nD 1.464 53 nD 1.465 12 nD	0.000 036 nD 0.000 082 nD 0.000 092 nD 0.000 21 nD 0.000 076 nD 0.000 076 nD	Refractive index liquids

Parameter/Equipment	Range	CMC ² (±)	Comments
Transmittance ³ /Absorbance ³	10 %T / 0.046 A 30 %T / 0.523 A 90 %T / 1.000 A	0.0032 A 0.0045 A 0.0047 A	Glass filters
Wavelength	(200 to 700) nm	0.11 nm	Holmium oxide solution wavelength standard

IX. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Temperature ³ – Measuring Equipment	(-196 to -38) °C (-38 to 0) °C (0 to 231) °C (231 to 400) °C (400 to 660) °C (660 to 1200) °C	0.01 °C 0.0081 °C 0.0052 °C 0.0097 °C 0.024 °C 0.24 °C	Digital thermometer with PRT Digital thermometer with thermocouple
Temperature ³ – Measure	(-196 to -38) °C (-38 to 0) °C (0 to 231) °C (231 to 400) °C (400 to 660) °C (660 to 1200) °C	0.010 °C 0.0080 °C 0.0051 °C 0.0096 °C 0.023 °C 0.24 °C	Digital thermometer with PRT Digital thermometer with thermocouple
Infrared Temperature ³ – Measure	(-18 to 80) °C (80 to 300) °C	0.059 °C 0.059 °C	Platinum resistance
Relative Humidity ³ – Measuring Equipment	(5 to 80) % RH (80 to 95) % RH	0.61 % RH 0.72 % RH	Relative humidity meter / relative humidity generator
Relative Humidity ³ – Measure	(5 to 80) % RH (80 to 95) % RH	0.61 % RH 0.72 % RH	Relative humidity meter

X. Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measure ³	(0 to 300) MHz	120 Hz + 10 µHz/Hz	Frequency counter
Frequency – Generate ³	(100 to 200) Hz (200 to 500) Hz (500 to 1000) Hz (1000 to 5000) Hz (5000 to 10 000) Hz (10 000 to 150 000) Hz (150 000 to 200 000) Hz (200 000 to 500 000) Hz (500 000 to 1 000 000) Hz	0.57 mHz 1.4 mHz 1.1 mHz 5.2 mHz 10 mHz 0.14 Hz 0.2 Hz 0.5 Hz 1.0 Hz	Multifunction calibrator
Frequency – Swept ³	(10 to 500) MHz	120 Hz + 1 µHz/Hz	Multifunction calibrator
Time Base (Pulse) – Generate ³	(0.005 to 50 000) kHz	120 Hz + 1 µHz/Hz	Multifunction calibrator
Time - Measure ³	(0 to 86 400) s	0.013 ms	Frequency counter

¹ This laboratory offers commercial calibration service and field calibration service.

² Calibration and Measurement Capability Uncertainty (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. CMCs 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 stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

⁵ Up to 15 000 kg Class F test weights using substitution method to 60 000 kg, The CMC is increased by a multiple for each substitution, to a maximum of three substitutions.

⁶ This laboratory meets *R205 – Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional tests listed above and is considered equivalent to that of a calibration.



Accredited Laboratory

A2LA has accredited

PHOENIX CALIBRATION

Santo Domingo, Dominican Republic

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 R205 – Specific Requirements: Calibration Laboratory Accreditation Program. 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 22nd of March 2017.

A blue ink signature of the President & CEO, written over a horizontal line.

President & CEO
For the Accreditation Council
Certificate Number 3022.01
Valid to October 31, 2018

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