



INTERNATIONAL  
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# CERTIFICATE OF ACCREDITATION

This is to attest that

## STANDARD METER LAB., INC.

236 RICKENBACKER CIRCLE  
LIVERMORE, CALIFORNIA 94551

Calibration Laboratory CL-146

has met the requirements of the IAS Accreditation Criteria for Calibration Laboratories (AC204), has demonstrated compliance with the ISO/IEC Standard 17025:2005, *General requirements for the competence of testing and calibration laboratories*, and has been accredited commencing February 25, 2016, for the calibration discipline(s) listed in the approved scope of accreditation. The laboratory meets IAS program requirements in the field of calibration.

*(see laboratory's scope of accreditation for fields of calibration and accredited calibration)*

*This accreditation certificate supersedes any IAS accreditation bearing an earlier effective date. The certificate becomes invalid upon suspension, cancellation or revocation of accreditation.*

*See <http://iasonline.org/More/search.html> for current accreditation information, or contact IAS at 562-364-8201.*



C.P. Ramani, P.E., C.B.O  
President



## SCOPE OF ACCREDITATION

IAS Accreditation Number	CL-146
Accredited Entity	Standard Meter Lab., Inc.
Address	236 Rickenbacker Circle Livermore, CA 94551
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Telephone	(925) 449-0220
Effective Date of Scope	February 25, 2016

MEASUREMENT AREA	RANGE & RESOLUTION	CALIBRATION & MEASUREMENT CAPABILITY <sup>1</sup> (CMC) (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
<i>Electrical – DC/LF</i> DC Voltage – Source	(0 to 329.9999) mV 330 mV to 3.29999 V (3.3 to 32.99999) V (30 to 329.9999) V (100 to 1020) V	20 µV/V + 1 µV 11 µV/V + 2 µV 12 µV/V + 20 µV 18 µV/V + 150 µV 18 µV/V + 1.5 mV	Fluke 5522A
DC Voltage – Measure	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	13 µV/V + 3 µV 17 µV/V + 0.3 µV 13 µV/V + 0.5 µV 15 µV/V + 30 µV 27 µV/V + 100 µV	HP3458A
High Voltage – Measure	(1-20) kV (20 to 35) kV (35 to 40) kV	2% 1% 2%	Fluke 80K40
DC Current – Source	(0 to 329.999) µA 330 µA to 3.29999 mA (3.3 to 32.9999) mA (33 to 329.999) mA 330 mA to 1.09999 A (1.1 to 2.99999) A (3 to 10.9999) A (11 to 20.5) A	150 µA/A + 0.02 A 100 µA/A + 0.05 µA 100 µA/A + 0.25 µA 100 µA/A + 2.5 µA 200 µA/A + 40 µA 380 µA/A + 40 µA 500 µA/A + 500 µA 1 mA/A + 750 µA	Fluke 5522A
Clamp Meter Calibrations	(10 to 16.4999) A (16.5 to 149.999)A (150 to 1025) A	5 mA/A + 0.02 A 5 mA/A + 0.14 A 5 mA/A + 0.5 A	5522A/Coil W/5522A 50-Turn Current Coil
DC Current - Measure	Up to 100 nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA 1 mA to 10 mA (10 to 100) mA 100 mA to 1 A  (1 to 20) A	35 ppm Rdg + 40 pA 25 ppm Rdg + 40 pA 25 ppm Rdg + 100 pA 25 ppm Rdg + 800 pA 25 ppm Rdg + 5 nA 25 ppm Rdg + 50 nA 40 ppm Rdg + 500 nA 115 ppm Rdg + 10 µA  0.01%	HP3458A  Fluke Y5020



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<i>Electrical – DC/LF (continued)</i> Resistance - Generate Calibrator	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω 330 Ω to 1.099999 kΩ (1.1 to 3.299999) kΩ (3.3 to 10.99999) kΩ (11 to 32.99999) kΩ (33 to 109.9999) kΩ (110 to 329.99999) kΩ 330 kΩ to 1.099999 MΩ (1.1 to 3.299999) MΩ (3.3 to 10.99999) MΩ (11 to 32.99999) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1100) MΩ	40 μΩ/Ω + 0.001 Ω 30 μΩ/Ω + 0.0015 Ω 28 μΩ/Ω + 0.0014 Ω 28 μΩ/Ω + 0.002 Ω 28 μΩ/Ω + 0.002 Ω 28 μΩ/Ω + 0.02 Ω 28 μΩ/Ω + 0.02 Ω 28 μΩ/Ω + 0.2 Ω 28 μΩ/Ω + 0.2 Ω 32 μΩ/Ω + 2 Ω 32 μΩ/Ω + 2 Ω 60 μΩ/Ω + 30 Ω 130 μΩ/Ω + 50 Ω 250 μΩ/Ω + 2.5 kΩ 500 μΩ/Ω + 3 kΩ 3 mΩ/Ω + 100 kΩ 15 mΩ/Ω + 500 kΩ	Fluke 5522A
Frequency - Measure	1 Hz to 39.99999 Hz 40 Hz to 10 MHz	0.05% Rdg 0.01% Rdg	HP 3458A
Frequency – Source 1 mV to 3.29999 V 3.3 V to 32.9999 V 33 V to 329.9999 V 330 V to 1020 V	10 to 500 kHz 10 to 100 kHz 45 to 100 kHz 45 to 10 kHz	<2.5 ppm <2.5 ppm <2.5 ppm <2.5 ppm	Fluke 5522A
Resistance – Measure	(0 to 10) Ω (10 to 100) Ω 100 Ω to 100 kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	19 parts in 10 <sup>6</sup> + 0.06 mΩ 13 parts in 10 <sup>6</sup> + 0.6 mΩ 10 parts in 10 <sup>6</sup> + 0.6 mΩ 15 parts in 10 <sup>6</sup> + 2.4 Ω 59 parts in 10 <sup>6</sup> + 120 mΩ 0.058% + 1.2 kΩ 1.8% + 10 kΩ	HP3458A
AC Voltage - Source (1 to 32.999) 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	800 μV/V + 6 μV 150 μV/V + 6 μV 200 μV/V + 6 μV 1000 μV/V + 6 μV 3.5 mV/V + 12 μV 8 mV/V + 50 μV	Fluke 5522A
(33 to 329.999) 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	300 μV/V + 8 μV 145 μV/V + 8 μV 160 μV/V + 8 μV 350 μV/V + 8 μV 800 μV/V + 32 μV 2 mV/V + 70 μV	



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<i>Electrical – DC/LF (continued)</i> AC Voltage - Source (0.33 to 3.29999) 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	300 µV/V + 50 µV 150 µV/V + 60 µV 190 µV/V + 60 µV 300 µV/V + 50 µV 700 µV/V + 125 µV 2.4 mV/V + 600 µV	Fluke 5522A
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	300 µV/V + 650 µV 150 µV/V + 600 µV 240 µV/V + 600 µV 350 µV/V + 600 µV 900 µV/V + 1600 µV	
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	190 µV/V + 2 mV 200 µV/V + 6 mV 250 µV/V + 6 mV 300 µV/V + 6 mV 2.0 mV/V + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	300 µV/V + 10 mV 250 µV/V + 10 mV 300 µV/V + 10 mV	
AC Voltage - Measure (1 to 10) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.03 % + 3 µV 0.02 % + 2 µV 0.03 % + 2 µV 0.12 % + 2 µV 0.58 % + 2 µV 4.6 % + 2 µV	HP3458A, synchronous sub-sample mode
(10 to 100) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	80 mV/V + 4 µV 80 mV/V + 2 µV 0.02 % + 2 µV 0.03 % + 2 µV 0.09 % + 2 µV 0.35 % + 10 µV 1.2 % + 10 µV 1.7 % + 10 µV	



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<i>Electrical – DC/LF (continued)</i> AC Voltage - Measure 100 mV to 1 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	80 mV/V + 40 µV 80 mV/V + 20 µV 0.02 % + 20 µV 0.03 % + 20 µV 0.09 % + 20 µV 0.35 % + 100 µV 1.2 % + 100 µV 1.7 % + 100 µV	HP3458A, synchronous sub-sample mode
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	80 mV/V + 0.4 mV 80 mV/V + 0.2 mV 0.02 % + 0.2 mV 0.03 % + 0.2 mV 0.09 % + 0.2 mV 0.35 % + 1 mV 1.2 % + 1 mV 1.7 % + 1 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.02 % + 4 mV 0.02 % + 2 mV 0.04 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV	
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.05 % + 40 mV 0.05 % + 20 mV 0.07 % + 20 mV 0.14 % + 20 mV 0.35 % + 20 mV	
High Voltage - Measure (1-28) kV rms	60 Hz	5 %	Fluke 80K40 & HP3458A
AC Current - Source (29 to 329.99) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.2 % + 0.1 µA 0.15 % + 0.1 µA 0.125 % + 0.1 µA 0.3 % + 0.15 µA 0.8 % + 0.2 µA 1.6 % + 0.4 µA	Fluke 5522A



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<i>Electrical – DC/LF (continued)</i> AC Current - Source 330 µA to 3.29999 mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.2 % + 0.15 µA 0.125 % + 0.15 µA 0.1 % + 0.15 µA 0.2 % + 0.2 µA 0.5 % + 0.3 µA 1.0 % + 0.6 µA	Fluke 5522A
(3.3 to 32.9999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.18 % + 2 µA 0.09 % + 2 µA 0.04 % + 2 µA 0.08 % + 2 µA 0.2 % + 3 µA 0.4 % + 4 µA	
(33 to 329.999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.18 % + 20 µA 0.09 % + 20 µA 0.04 % + 20 µA 0.10 % + 50 µA 0.20 % + 100 µA 0.40 % + 200 µA	
330 mA to 1.09999 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18% + 100 µA 0.05% + 100 µA 0.6% + 1000 µA 2.5% + 5000 µA	
(1.1 to 2.99999) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18% + 100 µA 0.06% + 100 µA 0.6% + 1000 µA 2.5% + 5000 µA	
(3 to 10.9999) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.06% + 2000 µA 0.10% + 2000 µA 3.0% + 2000 µA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12% + 5000 µA 0.15% + 5000 µA 3.0% + 5000 µA	



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<i>Electrical – DC/LF (continued)</i> Clamp Meter Calibrations 45 to 64 Hz	(10 to 16.4999) A (16.5 to 149.999)A (150 to 1025) A	0.56% output + 0.03 A 0.56% output + 0.25 A 0.56% output + 0.9 A	5500A/Coil - W/5522A
65 to 440 Hz	(10 to 16.4999) A (16.5 to 149.999)A (150 to 1025) A	1% output + 0.03 A 1% output + 0.25 A 1% output + 0.9 A	
AC Current - Measure (5 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.46 % + 0.03 µA 0.17 % + 0.03 µA 0.07 % + 0.03 µA 0.07 % + 0.03 µA	HP3458A, synchronous sub-sample mode
100 µA to 1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.5 % + 0.2 µA 0.17 % + 0.2 µA 0.07 % + 0.2 µA 0.04 % + 0.2 µA	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 200 µA 0.18 % + 200 µA 0.09 % + 200 µA 0.12 % + 200 µA	
(1 to 20) A	DC to 1 kHz (1 to 5) kHz	0.025% 0.035%	Fluke Y5020 - W/HP3458A
Capacitance - Source	(220.0 to 399.9) pF 10 Hz to 10 kHz (0.4 to 1.0999) nF 10 Hz to 10 kHz (1.1 to 3.2999) nF 10 Hz to 3 kHz (3.3 to 10.9999) nF 10 Hz to 1 kHz (11 to 32.9999) nF 10 Hz to 1 kHz (33 to 109.999) nF 10 Hz to 1 kHz (110 to 329.999) nF 10 Hz to 1 kHz (0.33 to 1.09999) µF (10 to 600) Hz	0.5% +10 pF 0.5% + 0.01 nF 0.5 % + 0.01 nF 0.25 % + 0.01 nF 0.25 % + 0.1 nF 0.25 % + 0.1 nF 0.25 % + 0.3 nF 0.25 % + 1 nF	Fluke 5522A



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<i>Electrical – DC/LF</i> <i>(continued)</i> Capacitance - Source	(1.1 to 3.29999) $\mu$ F (10 to 300) Hz (3.3 to 10.9999) $\mu$ F (10 to 150) Hz (11 to 32.9999) $\mu$ F (10 to 120) Hz (33 to 109.999) $\mu$ F (10 to 80) Hz (110 to 329.999) $\mu$ F (0 to 50) Hz (0.33 to 1.09999) mF (0 to 20) Hz (1.1 to 3.29999) mF (0 to 6) Hz (3.3 to 10.9999) mF (0 to 2) Hz (11 to 32.9999) mF (0 to 0.6) Hz (33 to 110) mF (0 to 0.2) Hz	0.25 % + 3 nF  0.25 % + 10 nF  0.40 % + 30 nF  0.45 % + 100 nF  0.45 % + 300 nF  0.45 % + 1 $\mu$ F  0.45 % + 3 $\mu$ F  0.45 % + 10 $\mu$ F  0.75 % + 30 $\mu$ F  1.1 % + 100 $\mu$ F	Fluke 5522A
<i>Thermal</i> Temperature (T/C) - Simulate Type B  Type C  Type E  Type J  Type K	(600 to 799.99) °C (800 to 999.99) °C (1000 to 1549.99) °C (1550 to 1820) °C (0 to 149.99) °C (150 to 649.99) °C (650 to 999.99) °C (1000 to 1799.99) °C (1800 to 2316) °C (-250 to -100.01) °C (-100 to -25.01) °C (-25 to 349.99) °C (350 to 649.99) °C (650 to 1000) °C (-210 to -100.01) °C (-100 to -30.01) °C (-30 to 149.99) °C (150 to 759.99) °C (760 to 1200) °C (-200 to -100.01) °C (-100 to -25.01) °C (-25 to 119.99) °C (120 to 999.99) °C (1000 to 1372) °C (-200 to -100.01) °C	0.44 °C 0.34 °C 0.30 °C 0.33 °C 0.30 °C 0.26 °C 0.31 °C 0.50 °C 0.84 °C 0.50 °C .016 °C 0.14 °C 0.16 °C 0.21 °C 0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C 0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.40 °C 0.37 °C	Fluke 5522A





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<i>Thermal</i> Temperature (T/C) - Simulate			
Type L	(-100 to 799.99) °C	0.26 °C	Fluke 5522A
	(800 to 900) °C	0.17 °C	
Type N	(-200 to -100.01) °C	0.40 °C	
	(-100 to -25.01) °C	0.22 °C	
	(-25 to 119.99) °C	0.19 °C	
	(120 to 409.99) °C	0.18 °C	
Type R	(410 to 1300) °C	0.27 °C	
	(0 to 249.99) °C	0.57 °C	
	(250 to 399.99) °C	0.35 °C	
	(400 to 999.99) °C	0.33 °C	
Type S	(1000 to 1767) °C	0.40 °C	
	(0 to 249.99) °C	0.47 °C	
	(250 to 999.99) °C	0.36 °C	
Type T	(1000 to 1399.99) °C	0.37 °C	
	(1400 to 1767) °C	0.46 °C	
	(-250 to -150.01) °C	0.63 °C	
	(-150 to -0.01) °C	0.24 °C	
Type U	(0 to 119.99) °C	0.16 °C	
	(120 to 400) °C	0.14 °C	
	(-200 to -0.01) °C	0.56 °C	
	(0 to 600) °C	0.27 °C	
Temperature (RTD) - Simulate PT 385, 100 Ω			
	(-200 to -80.01) °C	0.05 °C	
	(-80 to -0.01) °C	0.05 °C	
	(0 to 99.99) °C	0.07 °C	
	(100 to 299.99) °C	0.09 °C	
	(300 to 399.99) °C	0.10 °C	
	(400 to 629.99) °C	0.12 °C	
	(630 to 800) °C	0.23 °C	
	(-200 to -80.01) °C	0.05 °C	
	(-80 to -0.01) °C	0.05 °C	
	(0 to 99.99) °C	0.07 °C	
	(100 to 299.99) °C	0.09 °C	
	(300 to 399.99) °C	0.10 °C	
	(400 to 629.99) °C	0.12 °C	
	(-200 to -190.01) °C	0.25 °C	
	(-190 to -80.01) °C	0.04 °C	
	(-80 to -0.01) °C	0.05 °C	



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Temperature (RTD) – Simulate (continued) PT 385, 100 Ω	(0 to 99.99) °C (100 to 259.99) °C (260 to 299.99) °C (300 to 399.99) °C (400 to 599.99) °C (600 to 630) °C (-200 to -80.01) °C (-80 to -0.01) °C (0 to 99.99) °C (100 to 259.99) °C (260 to 299.99) °C (300 to 399.99) °C (400 to 599.99) °C (600 to 630) °C (-200 to -80.01) °C (-80 to -0.01) °C (0 to 99.99) °C (100 to 259.99) °C (260 to 299.99) °C (300 to 399.99) °C (400 to 599.99) °C (600 to 630) °C (-200 to -80.01) °C (-80 to -0.01) °C (0 to 99.99) °C (100 to 259.99) °C (260 to 299.99) °C (300 to 399.99) °C (400 to 599.99) °C (600 to 630) °C (-200 to -80.01) °C (-80 to -0.01) °C (0 to 99.99) °C (100 to 259.99) °C (260 to 299.99) °C (300 to 399.99) °C (400 to 599.99) °C (600 to 630) °C (-80 to -0.01) °C (0 to 99.99) °C (100 to 260) °C (-100 to 260) °C	0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.10 °C 0.23 °C 0.04 °C 0.04 °C 0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C 0.04 °C 0.05 °C 0.05 °C 0.06 °C 0.08 °C 0.08 °C 0.09 °C 0.11 °C 0.03 °C 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.07 °C 0.23 °C 0.08 °C 0.08 °C 0.14 °C 0.3 °C	Fluke 5522A
<i>Thermal</i> Temperature - Measure	-100°C to 0°C >0°C to 100°C >100°C to 400°C	0.009°C 0.007°C 0.018°C	M2801/IRTD-400
<i>Mechanical</i> Torque	2.5 to 25 lb in (25 to 250 lb in) 10 to 100 lbf ft (100 to 1000 lbf ft)	0.7% of reading 0.5% of reading 0.9% of reading 0.5% of reading	BMX-25i BMX-250i TL-100F BMX-100i



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Oscilloscope			Fluke 5522A W/SC1100 (1.1 GHz Oscope Option)
Leveled Sine Amp 50 kHz Ref.	5 mV to 5 V (Vp-p)	2.0 % of R <sub>dg</sub> + 0.30 mV	
Leveled Sine Flatness Into 50 Ω	50 kHz to 100 MHz (100 to 200) MHz (300 to 600) MHz 600 MHz to 1.1 GHz	3.7 % of rdg + 0.30 mV 4.2 % of rdg + 0.30 mV 6.2 % of rdg + 0.30 mV 7.2 % of rdg + 0.30 mV	
Square Wave 10 Hz to 10 kHz Into 50 Ω	1.8 mV to 2.5 V(p-p) 1.8 mV to 55 V(p-p)	3 % of (p-p) of rdg + 0.10 mV 3 % of (p-p) of rdg + 0.10 mV	
Time Marker	5s to 50 ms	(25 + t*1000) μs/s	t* in seconds

<sup>1</sup>“Calibration and Measurement Capability” 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 of nearly ideal measuring instruments. Calibration and Measurement Capabilities are expressed as uncertainties at approximately the 95% level of confidence, usually using a coverage factor of  $k=2$ . The measurement uncertainty of a specific calibration performed by the laboratory may be greater than the least uncertainty due to the behavior of the customer’s device, to the environment (if the calibration is performed in the field), and to influences from the circumstances of the specific calibration