

International Accreditation Service, Inc.

CERTIFICATE OF ACCREDITATION

This is to signify that

A-CAL/ASSOCIATED CALIBRATION, INC.

4583 E. EISENHOWER CIRCLE
ANAHEIM, CALIFORNIA 92807

Calibration Laboratory CL-103
(Revised June 12, 2009)

has demonstrated compliance with the ANS/ISO/IEC Standard 17025:2005, *General criteria for the competence of testing and calibration laboratories*, and has been accredited commencing June 13, 2007, for the calibration discipline(s) listed in the approved scope of accreditation. The laboratory meets the IAS program requirements in the field of calibration.



Patrick V. McCullen
Vice President



C. P. Ramani, P.E.
President

(see attached scope of accreditation for measurement area or type of test, range or quantity, best measurement capability, technique reference, standard equipment or unique conditions)

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International Accreditation Service, Inc.

SCOPE OF ACCREDITATION

A-Cal/Associated Calibration, Inc. CL-103
(Revised March 20, 2008)

A-Cal/Associated Calibration, Inc.
4583 E. Eisenhower Circle
Anaheim, CA 92807

Jerry Schwarz
President
(714) 696-5300

MEASUREMENT AREA	RANGE & RESOLUTION	BEST MEASUREMENT CAPABILITY ¹ (BMC) (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
<i>Dimensional</i> Calipers	0-4"/0.001" 0-6"/0.001" 0-8"/0.001" 0-12"/0.001" 0-18"/0.001" 0-24"/0.001" 0-36"/0.001" 0-40"/0.001" 0-60"/0.001"	0.001" 0.0012" 0.0015" 0.0016" 0.0018" 0.0019" 0.002" 0.0022" 0.0025"	Using Gauge Blocks and End Standards

June 13, 2007
Commencement Date



C. P. Ramani, P.E.
President

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Calipers (<i>cont.</i>)	0-4"/0.0005"	0.0004"	Using Gauge Blocks and End Standards
	0-6"/0.0005"	0.0005"	
	0-8"/0.0005"	0.0007"	
	0-12"/0.0005"	0.0008"	
	0-18"/0.0005"	0.001"	
	0-24"/0.0005"	0.0012"	
	0-40"/0.0005"	0.0014"	
0-60"/0.0005"	0.0018"		
Micrometers (External)	up to 2"/0.001"	0.001"	Using Gauge Blocks
	>2" up to 4"/0.001"	0.0013"	
	>4" up to 6"/0.001"	0.0015"	
	6" to 8"/0.001"	0.0016"	
	8" to 12"/0.001"	0.002"	

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Micrometers (External) (<i>cont.</i>)	Up to 2"/0.0001"	0.0001"	Using Gauge Blocks
	>2" up to 4"/0.0001"	0.00012"	
	>4" up to 6"/0.0001"	0.00014"	
	6" to 8"/0.0001"	0.00017"	
	8" to 12"/0.0001"	0.00019"	
	0-1"/0.00005"	0.00004"	
Dial Indicator (Mechanical/Electronic)	0-1"/0.0005"	0.0007"	Using Gauge Blocks
	0-2"/0.0005"	0.0008"	
	0-1"/0.0001"	0.0001"	
	0-2"/0.0001"	0.00014"	
	0-1"/0.00005"	0.00007"	
	0-2"/0.00005"	0.00008"	
Depth Gauge	0-8"/0.001"	0.0015"	Using Gauge Blocks

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Ring Gauge	up to dia 6"	0.00008"	On "Federal" Comparator with Gauge Blocks for Setting
Plug Gauges	up to dia. 1"	0.00005"	Gauge Blocks and Comparator Stand
	> dia. 1" up to dia. 2"	0.00007"	
	> dia. 2" up to dia. 4"	0.0001"	
Thread Plug Gauge	up to major dia. 1" (Effective/Pitch dia. & major dia. Only)	0.0005"	Using Three Wire Set and MU-checker
End Standards	up to 6"	0.000025"	Using Height Master, Riser Blocks, Gauge Blocks and Electronic Pick-up
	>6" up to 12"	0.000100"	
	>12" up to 24"	0.000170"	
	>24" up to 36"	0.000280"	
Height Gauges	0-12"/0.001"	0.0016"	Using End Standards and Electronic pick-up with μ -checker
	0-24"/0.001"	0.0019"	

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Height Gauges (<i>cont.</i>)	0-12"/0.0001"	0.00017"	Using End Standards and Electronic pick-up with μ -checker
	0-24"/0.0001"	0.00028"	
Riser Blocks	up to 12"	0.00008"	Using Gauge Blocks and M μ -checker
Microscope	X-Y Range: 6" x 4" (Resolution 0.0001")	0.00018"	Using Gauge Blocks and Image Reticles
	X-Y Range: 6" x 4" (Resolution 0.0005")	0.0008"	
Super Micrometer	0-1"/0.0001"	0.00008"	Using Gauge Blocks
Bevel Protractor	0-360°/5 min of arc	10 mins of arc	Using angle gauge blocks

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Mass	5kg	150 mg	Use Conversion Factor of 1 lb = 453.59237 grams or 1 gram = 0.0022046 lbs
	2kg	15 mg	
	1kg	10 mg	
	100 gms	0.08 mg	
	50 gms	0.06 mg	
	30 gms	0.04 mg	
	20 gms	0.025 mg	
	10 gms	0.025 mg	
	5 gms	0.008 mg	
	3 gms	0.008 mg	
	2 gms	0.008 mg	
	1 gm	0.008 mg	
500 mg	0.004 mg		
300 mg	0.004 mg		

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Mass (<i>cont.</i>)	200 mg	0.002 mg	Use Conversion Factor of 1 lb = 453.59237 grams or 1 gram = 0.0022046 lbs Sartorius Electrical Analytical Balance Sartorius Electrical Balance Sartorius Electrical Balance
	100 mg	0.002 mg	
	50 mg	0.002 mg	
	30 mg	0.002 mg	
	20 mg	0.002 mg	
	10 mg	0.002 mg	
	50 lbs	0.6 gram	
	0 to 230 g	0.06 mg	
230 to 1,200 g	0.96 mg		
1,200 to 34,00 g	0.075 g		
<i>Mechanical</i>	100-1000 gmf	2%	Gram Force Gauges
Force – Compression	0 to 20 lbf	0.04% of indicated value	ASTM E 4 Method - Using Proving Rings
	>20 to 5,000 lbf	0.04% of indicated value	

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Force – Compression (<i>cont.</i>)	>5,000 to 6,000 lbf	0.04% of indicated value	ASTM E 4 Method - Using Proving Rings
	>6,000 to 20,000 lbf	0.05% of indicated value	
>20,000 to 200,000 lbf	0.06% of indicated value		
Force – Compression (<i>cont.</i>)	0 to 3,000 lbf	0.03% of indicated value	ASTM E 4 Method Using Load Cells & Readout
	>3,000 to 6,000 lbf	0.03% of indicated value	
	>6,000 to 30,000 lbf	0.03% of indicated value	
	>30,000 to 120,000 lbf	0.04% of indicated value	
	>120,000 to 300,000 lbf	0.05% of indicated value	
	>300,000 to 600,000 lbf	112.6 lbf	
Force – Tension	0 to 500 lbf	0.03% of indicated reading	ASTM E 4 Using Proving Rings
	>500 to 3,000 lbf	0.03% of indicated reading	
	>3,000 to 5,000 lbf	0.04% of indicated reading	
	>5,000 to 20,000 lbf	0.05% of indicated reading	

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Force – Tension (<i>cont.</i>)	>20,000 to 30,000 lbf >30,000 to 120,000 lbf	0.05% of indicated reading 0.06% of indicated reading	ASTM E 4 Using Proving Rings
Hardness Testers	HRC Scale	0.4 HRC	Indirect Method (ASTM E 18-05) SunTech Standard Hardness Test Blocks
	HRA Scale	1.0 HRA	
	HRBW Scale	0.9 HRBW	
	HRBS Scale	0.9 HRBS	
	HR15N Scale	1.1 HR15N	
HR30N Scale	1.1 HR30N		
HR45N Scale	1.1 HR45N		
HR15T Scale	1.1 HR15T		
HR30T Scale	1.1 HR30T		
HR45T Scale	1.1 HR45T Scale		

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Durometer Type A, B, O	0-100 Points (56.08 g to 820.87 g)	2 Points	Sartorius Electronic Balance
Type C, D, DO	0-100 Points (0 g to 4.53 Kg)	2 Points	Sartorius Electronic Balance
Indentor Calibration	0.096 in to 0.100 in	0.000327"	Mitutoyo Digital Caliper
Precision Balances, Single Pan Balances	1 mg to 35 kg up to 1 lb > 1 lb up to 2 lbs >2 lbs up to 5 lbs >5 lbs up to 10 lbs >10 lbs up to 20 lbs up to 50 lbs	See note 8 mg 10 mg 12 mg 18 mg 150 mg 5 gms	Sartorius Ultra Class Weights Using Conversion Factor of 1 lb = 453.59237 grams or 1 gram = 0.0022046 lbs

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Precision Balances (<i>cont.</i>)	up to 80 gms > 80 gms to 3.6 kg > 3.6 kg to 6.1 kg	0.2 mg 10 gms 100 gms	On Platform Scale
Platform Scales	0.5 lbs to 2,000 lbs	See note	Rice Lake Class F Weights
Pressure	0.1-10,000 psi	0.01% of indicated value	Hydraulic Dead Weight Tester
	0-5,000 psi	0.3% of indicated value	Pneumatic Digital Pressure Indicator
	0-120" of Hg	0.1% of indicated value	Using Digital Pressure Gauge
	0-200" of Water	0.1% of indicated value	Using Pressure Gauge
	200-800" of Water	0.1% of indicated value	Using Pressure Gauge
	0-2,000" of Water	0.1% of indicated value	Using Pressure Gauge
Vacuum - Measure	0 to 30 inHg	<0.003 inHg	Vacuum Gauge
	30 to 120 inHg	0.1 psig	Digital Gauge

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Torque – Measure	4 to 50 in. lbs.	0.25%	Torque Transducer, 10-100% of range Torque Transducer, 10-100% of range Torque Transducer, 10-100% of range Torque Transducer, 10-100% of range Torque Wrench
	>50 to 400 in. lbs.	0.45%	
	>400 to 1000 in. lbs.	0.45%	
	20 to 250 ft. lbs.	0.45%	
	>250 to 2000 ft. lbs.	0.75%	
<i>Thermal</i> Humidity - Measure	10.00 to 95.00%	0.87% RH	Dig. Hygrometer Thermometer
Calibration of Thermocouples and Thermocouple Indicators			5500A Multifunction Calibrator
Type B	600 to 800 °C 800 to 1000 °C 1000 to 1550 °C 1550 to 1820 °C	0.44 °C 0.34 °C 0.3 °C 0.33 °C	
Type C	0 to 150 °C 150 to 650 °C	0.3 °C 0.26 °C	

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Type E	50 to 1000 °C	0.31 °C	
	1000 to 1800 °C	0.5 °C	
	1800 to 2316 °C	0.84 °C	
Type J	-250 to -100 °C	0.5 °C	
	-100 to -25 °C	0.16 °C	
	-25 to 350 °C	0.14 °C	
	350 to 650 °C	0.16 °C	
	650 to 1000 °C	0.21 °C	
Type K	-210 °C to -100 °C	0.27 °C	
	-100 to -30 °C	0.16 °C	
	-30 to 150 °C	0.14 °C	
	150 to 760 °C	0.17 °C	
	760 to 1200 °C	0.23 °C	
Type K	-210 °C to -100 °C	0.33 °C	
	-100 to -25 °C	0.18 °C	
	-25 to 120 °C	0.16 °C	
	120 to 1000 °C	0.26 °C	

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Type L	1000 to 1372 °C -200 to -100 °C -100 to 800 °C	0.4 °C 0.37 °C 0.26 °C	
Type N	800 to 900 °C -200 to -100 °C -100 to -25 °C -25 to 120 °C 120 to 410 °C 410 to 1300 °C	0.17 °C 0.4 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R	0 to 250 °C 250 to 400 °C 400 to 1000 °C 1000 to 1767 °C	0.57 °C 0.35 °C 0.33 °C 0.4 °C	
Type S	0 to 250 °C 250 to 1000 °C	0.47 °C 0.36 °C	

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Type T	1000 to 1400 °C 1400 to 1767 °C	0.37 °C 0.46 °C	
Type U	-250 to -150 °C -150 to 0 °C 0 to 120 °C 120 to 400 °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C	
Calibration of RTD – Generate Pt 385, 100 Ω	-200 to 0 °C 0 to 100 °C 100 to 300 °C 300 to 400 °C 400 to 630 °C 630 to 800 °C	0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C	5500A Multifunction Calibrator

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Pt 3926, 100 Ω	-200 to 0 °C 0 to 100 °C 100 to 300 °C 300 to 400 °C 400 to 630 °C	0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °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	0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C	
Pt 385, 200 Ω	-200 to 100 °C 100 to 260 °C 260 to 300 °C 300 to 400 °C	0.04 °C 0.05 °C 0.12 °C 0.13 °C	

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Pt 385, 500 Ω	400 to 600 °C	0.14 °C	
	600 to 630 °C	0.16 °C	
	-200 to -80 °C	0.04 °C	
	-80 to 100 °C	0.05 °C	
	100 to 260 °C	0.06 °C	
	260 to 400 °C	0.08 °C	
Pt 385, 1000 Ω	400 to 600 °C	0.09 °C	
	600 to 630 °C	0.11 °C	
	-200 to 0 °C	0.03 °C	
	0 to 100 °C	0.04 °C	
	100 to 260 °C	0.05 °C	
	260 to 300 °C	0.06 °C	
PtNi 385, 120 Ω	300 to 600 °C	0.07 °C	
	600 to 630 °C	0.23 °C	
	-80 to 100 °C	0.08 °C	
	100 to 260 °C	0.14 °C	

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Cu 427, 10 Ω	-100 to 260 °C	0.3 °C	
Temperature Calibration – Measure	0 - 199.999 999 Ω 200 - 1999.999 99 Ω	ppm Reading +mΩ 7.5 + 0.14 7.5 + 0.5	8508A Multimeter
Temperature Readout - Resistance	0 to 200Ω 200Ω to 2kΩ	(ppm Reading plus mΩ) (7.5 + 0.14) (7.5 + 0.5)	Fluke 8508A (25 and 100Ω PRT/SPRT) (100Ω PRT/SPRT only)
Conductivity – Source	29.92 PIACS 44.70 PIACS 58.93 PIACS	1% 0.35 PIACS 0.35 PIACS	Conductivity Standards Conductivity Standards Conductivity Standards
<i>Electromagnetic—DC/Low Frequency</i>			

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SCOPE OF ACCREDITATION

A-Cal/Associated Calibration, Inc. CL-103
(Revised March 20, 2008)

MEASUREMENT AREA	RANGE & RESOLUTION	BEST MEASUREMENT CAPABILITY ¹ (BMC) (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
AC Current – Source	0.029 to 0.32999 Milliampères		
	@ 10 to 20 Hz	(0.25% + 0.15mA)	Multifunction Calibrator
	@ 20 to 45 Hz	(0.125% + 0.15mA)	Multifunction Calibrator
	@ 45 Hz to 1 kHz	(0.125% + 0.25mA)	Multifunction Calibrator
	@1 to 5 kHz	(0.4% + 0.15mA)	Multifunction Calibrator
	@5 to 10 kHz	(1.25% + 0.15mA)	Multifunction Calibrator
	0.33 to 3.2999 Milliampères		
	@10 to 20 Hz	(0.2% + 0.3mA)	Multifunction Calibrator
	@20 to 45 Hz	(0.1% + 0.3mA)	Multifunction Calibrator
	@45 Hz to 1 kHz	(0.1% + 0.3mA)	Multifunction Calibrator
@1 to 5 kHz	(0.2% + 0.3mA)	Multifunction Calibrator	
@5 to 10 kHz	(0.6% + 0.3mA)	Multifunction Calibrator	

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<i>Electromagnetic—DC/Low Frequency</i> AC Current – Source (Cont'd.)	3.3 to 32.999 Milliampere		
	@10 to 20 Hz	(0.2% + 3mA)	Multifunction Calibrator
	@20 to 45 Hz	(0.1% + 3mA)	Multifunction Calibrator
	@45 Hz to 1 kHz	(0.09% + 3mA)	Multifunction Calibrator
	@1 to 5 kHz	(0.2% + 3mA)	Multifunction Calibrator
	@5 to 10 kHz	(0.6% + 3mA)	Multifunction Calibrator
	33 to 329.99 Milliampere		
	@10 to 20 Hz	(0.2% to 30mA)	Multifunction Calibrator
	@20 to 45 Hz	(0.1% + 30mA)	Multifunction Calibrator
	@45 Hz to 1 kHz	(0.09% + 30mA)	Multifunction Calibrator
@1 to 5 kHz	(0.2% + 30mA)	Multifunction Calibrator	
@5 to 10 kHz	(0.6% + 30mA)	Multifunction Calibrator	
0.33 to 2.19999 Amperes			

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AC Current – Source (<i>cont.</i>)	@10 to 20 Hz @45 Hz to 1 kHz @1 to 5 kHz 2.2 to 11 Amperes @45 to 65 Hz @65 to 500 Hz @500 Hz to 1 kHz	(0.2% + 300mA) (0.1% + 300mA) (0.75% + 300mA) (0.06% + 2000mA) (0.10% + 2000mA) (0.33% + 2000mA)	Multifunction Calibrator Multifunction Calibrator Multifunction Calibrator Multifunction Calibrator Multifunction Calibrator Multifunction Calibrator
AC Current – Measure	0 to 20mA @1 – 10Hz @10Hz - 10kHz @10k - 30kHz @30k - 100kHz	(ppm Reading plus ppm Range) (310 + 100) (300 + 100) (710 + 100) (0.4 % + 100)	Fluke 8508A

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AC Current – Measure (cont.)	>20 to 200mA @1 – 10Hz @10Hz - 10kHz @10k - 30kHz >200mA to 2A @10 Hz- 2kHz @2k - 10kHz @10k - 30kHz >2 to 20A @10 Hz- 2kHz @2k - 10kHz 0 to 2500 Amperes	(310 + 100) (290 + 100) (625 + 100) (620 + 100) (725 + 100) (0.3 % + 100) (820 + 100) (0.25 % + 100) 0.5% of measured value	Current Shunt & DMM

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AC Voltage – Source	1.0 to 32.99 mV		
	@10 to 45 Hz	(0.35% + 20mV)	Multifunction Calibrator
	@45 Hz to 10 kHz	(0.15% + 20mV)	Multifunction Calibrator
	@10 to 20 kHz	(0.2% + 20mV)	Multifunction Calibrator
	@20 to 50 kHz	(0.25% + 20mV)	Multifunction Calibrator
	@50 to 100 kHz	(0.35% + 33 mV)	Multifunction Calibrator
	@100 to 500 kHz	(1% + 60mV)	Multifunction Calibrator
	33 to 329.999 mV		
	@10 to 45 Hz	(0.25% + 50mV)	Multifunction Calibrator
	@45 Hz to 10 kHz	(0.05% + 20□V)	Multifunction Calibrator
@10 to 20 kHz	(0.1% + 20□V)	Multifunction Calibrator	
@20 to 50 kHz	(0.16% + 40□V)	Multifunction Calibrator	
@50 to 100 kHz	(0.24% + 170□V)	Multifunction Calibrator	

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AC Voltage – Source (cont.)	@100 to 500 kHz	(0.7% + 330mV)	Multifunction Calibrator
	0.33 to 3.29999 V		
	@10 to 45 Hz	(0.15% + 250mV)	Multifunction Calibrator
	@45 Hz to 10 kHz	(0.03% + 60mV)	Multifunction Calibrator
	@10 to 20 kHz	(0.08% + 60mV)	Multifunction Calibrator
	@20 to 50 kHz	(0.14% + 300mV)	Multifunction Calibrator
	@50 to 100 kHz	(0.24% + 1700mV)	Multifunction Calibrator
	@100 to 500 kHz	(0.5% + 3300mV)	Multifunction Calibrator
	3.3 to 32.9999 V		
	@10 to 45 Hz	(0.15% + 2500mV)	Multifunction Calibrator
@45 Hz to 10 kHz	(0.04% + 600mV)	Multifunction Calibrator	
@10 to 20 kHz	(0.08% + 2600mV)	Multifunction Calibrator	
@20 to 50 kHz	(0.19% + 5000mV)	Multifunction Calibrator	

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AC Voltage – Source (cont.)	@50 to 100 kHz	(0.24% + 17000mV)	Multifunction Calibrator
	33 to 329.999 V		
	@45 Hz to 1 kHz	(0.05% + 6.6mV)	Multifunction Calibrator
	@1 to 10 kHz	(0.08% + 15mV)	Multifunction Calibrator
	@10 to 20 kHz	(0.09% + 33mV)	Multifunction Calibrator
	330 to 1000 V		
AC Voltage – Measure	@45 Hz to 1 kHz	(0.05% + 80mV)	Multifunction Calibrator
	@1 to 5 kHz	(0.20% + 100mV)	Multifunction Calibrator
	@5 to 10 kHz	(0.20% + 500mV)	Multifunction Calibrator
	0 to 200mV	ppm Reading plus ppm Range	
	@1 – 10Hz	(165 + 70)	Fluke 8508A
	@10 – 40Hz	(140 + 20)	

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AC Voltage – Measure (cont.)	@40 – 100Hz	(115 + 20)	Fluke 8508A
	@100Hz - 2kHz	(110 + 10)	
	@2k - 10kHz	(135 + 20)	
	@10k - 30kHz	(340 + 40)	
	@30k - 100kHz	(765 + 100)	
	>200mV to 200V		
	@1 – 10Hz	(150 + 60)	
	@10 – 40Hz	(115 + 10)	
	@40 – 100Hz	(90 + 10)	
	@100Hz - 2kHz	(75 + 10)	
@2k - 10kHz	(110 + 10)		
@10k - 30kHz	(220 + 20)		
@30k - 100kHz	(570 + 100)		

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AC Voltage – Measure (<i>cont.</i>)	@100k - 300kHz @300kHz - 1MHz >200V to 1050V @1 – 10Hz @10 – 40Hz @40 – 10kHz @10k - 30kHz @30k - 100kHz >1 to 20 kV @20 to 100 Hz	(0.3% + 0.1%) (1% + 1%) (150 + 70) (120 + 20) (115 + 20) (225 + 40) (580 + 200) (0.4% of rdg. 40V)	Precision HV Meter
Capacitance – Source	1 nF 0 to 1 µF 1.0 to 1.0999 µF	0.1% of indic. + 1 div 0.5% of reading	Standard Capacitor Decade Capacitor

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Capacitance – Source (<i>cont.</i>)	@50 to 1000 Hz 1.1 to 3.2999 µF	(0.25% + 1nF) @ 5kHz	Multifunction Calibrator
	@50 to 1000 Hz 3.3 to 10.999 µF	(0.35% + 3nF) @ 2kHz	Multifunction Calibrator
	@50 to 400 Hz 11 to 32.999 µF	(0.35% + 10nF) @ 1.5kHz	Multifunction Calibrator
	@50 to 400 Hz 33 to 109.99 µF	(0.40% + 30nF) @ 800 Hz	Multifunction Calibrator
	@50 to 200 Hz 110 to 329.99 µF	(0.50% + 100nF) @ 400 Hz	Multifunction Calibrator
	@50 to 100 Hz 330 to 1.1 mF	(0.70% + 300nF) @ 200 Hz	Multifunction Calibrator
	@50 to 100 Hz	(1% + 300nF) @ 150 Hz	Multifunction Calibrator

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DC Current – Source	0 to 3.29999 mA	(0.013% + 0.05µA)	Multifunction Calibrator
	3.3 mA to 32.9999 mA	(0.01% + 0.25µA)	Multifunction Calibrator
	33 mA to 329.999 mA	(0.01% + 3.3µA)	Multifunction Calibrator
	330mA to 2.19999 A	(0.03% + 44µA)	Multifunction Calibrator
	2.2 A to 11 A	(0.06% + 330µA)	Multifunction Calibrator
DC Current – Measure	0 to 2mA	(ppm Reading plus ppm Range) (12 + 2.0)	Fluke 8508A
	>2 to 20mA	(14 + 2.0)	
	>20 to 200mA	(48 + 4.0)	
	>200mA to 2A	(185 + 8.0)	
	>2 to 20A	(400 + 20)	
	0 to 2500 Amperes	0.57% of measured value	Current Shunt & DMM

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DC Voltage – Source	0 to 111.111110V 0 to 329.9999 mV 330mV to 3.299999V 3.3 to 32.99999V 33 to 329.9999V 100V to 1020V	(0.005% + (0.00075% of range or 5 μV)) (% Output plus μV) (.006 + 3) (.005 + 5) (.005 + 50) (.0055 + 500) (.0055 + 1500)	Direct Voltage Standard Multifunction Calibrator
DC Voltage – Measure	0 to 200mV >200mV to 20V >20 to 200V >200 to 1000.000V >1000 to 2000V >2 to 20kV	(ppm Reading plus ppm Range) (5.0 + 0.5) (3.5 + 0.2) (5.5 + 0.2) (5.5 + 0.5) (0.04% rdg. 0.4V) (0.04% rdg. 4V)	Fluke 8508A Precision HV Meter Precision HV Meter

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MEASUREMENT AREA	RANGE & RESOLUTION	BEST MEASUREMENT CAPABILITY ¹ (BMC) (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
Resistance - Source	0 to 10.99 Ω	(0.012% + 0.008 Ω)	Multifunction Calibrator
	11 to 32.999 Ω	(0.012% + 0.015 Ω)	Multifunction Calibrator
	33 to 109.999 Ω	(0.009% + 0.015 Ω)	Multifunction Calibrator
	110 to 329.999 Ω	(0.009% + 0.015 Ω)	Multifunction Calibrator
	330 to 1.09999 kΩ	(0.009% + 0.06 Ω)	Multifunction Calibrator
	1.1 to 3.29999 kΩ	(0.009% + 0.06 Ω)	Multifunction Calibrator
	3.3 to 10.9999 kΩ	(0.009% + 0.6 Ω)	Multifunction Calibrator
	11 to 32.9999 kΩ	(0.009% + 0.6 Ω)	Multifunction Calibrator
	33 to 109.999 kΩ	(0.011% + 6 Ω)	Multifunction Calibrator
	110 to 329.999 kΩ	(0.012% + 6 Ω)	Multifunction Calibrator
	330 kohms to 1.09999 MΩ	(0.015% + 55 Ω)	Multifunction Calibrator
	1.1 to 3.29999 MΩ	(0.015% + 55 Ω)	Multifunction Calibrator
3.3 to 10.9999 MΩ	(0.06% + 550 Ω)	Multifunction Calibrator	

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Resistance (<i>cont.</i>)	11 to 32.9999 MΩ	(0.1% + 550 Ω)	Multifunction Calibrator
	33 to 109.999 MΩ	(0.5% + 5.5 kΩ)	Multifunction Calibrator
	110 to 330 MΩ	(0.5% + 16.5 kΩ)	Multifunction Calibrator
	1 Ω	24x10 ⁻⁶	Standard Resistor
	10 Ω	16x10 ⁻⁶	Standard Resistor
	1000 Ω	10x10 ⁻⁶	Standard Resistor
Resistance – Measure	10,000 Ω	25x10 ⁻⁶	Standard Resistor
	0 to 6000 Ω	1% 5 counts	Dig. Clamp Meter
	0 to 2Ω	(ppm Reading plus ppm Range) (17 + 2.0)	Fluke 8508A
	>2 to 20Ω	(9.5 + 0.7)	
>20Ω to 200kΩ	(8.0 + 0.25)		
>200kΩ to 2MΩ	(9.0 + 0.5)		

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Resistance – Measure (<i>cont.</i>)	>2 to 20MΩ >20 to 200MΩ >200MΩ to 2GΩ	(20 + 5.0) (120 + 50) (1510 + 500)	Fluke 8508A
Inductance - Source	1, 10 and 100 mH 100 μH 1 and 10 H	0.1% 0.25% 0.1%	Standard Inductors Standard Inductor Standard Inductor
<i>Time and Frequency</i> Frequency - Measure	0 to 3 GHz	<3x10 ⁻⁷	Universal Counter
Frequency - Source	0.01Hz to 10 kHz >10 kHz to 2 MHz 5 Secs to @ n Secs 50 kHz to 600 MHz	25 ppm = 0.001 Hz 25 ppm = 0.015 Hz 0.5% 1.5% Flatness	Multifunction Calibrator Multifunction Calibrator Scope Calibrator Scope Calibrator

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Time Verification	0 to 10 Hrs	0.043%	Stopwatch
Stopwatches, Timers	24 Hrs (calculated)	8.6E – 3 spd	Vibrograf TM-4500

¹ "Best 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. Best 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.

NOTE: Calibration parameters are performed primarily on-site at customer locations. The uncertainty of scale/balance calibration is highly dependent on local conditions, such as scale resolution and sensitivity, scale cleanliness, local gravity, temperature and humidity, dust, vibration, etc.; therefore, any statement of uncertainty is misleading. The class of the best weights used by the laboratory is shown in the Technique column. Use of weights in combination, whether in the same class or different classes, will increase measurement uncertainty resulting from the additive effect of weight tolerances, as defined in ASTM E 617.

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