



National Voluntary Laboratory Accreditation Program



CALIBRATION LABORATORIES

NVLAP LAB CODE 200990-0

Scope Revised: 2012-12-06

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Transcat – Denver 3251 Lewiston St, Suite 12 Denver, CO 80011 Mr. Ryan Gohl Phone: 303-364-8325 Fax: 303-364-8353 E-mail: rghol@transcat.com URL: www.transcat.com	Parameter(s) of Accreditation Dimensional Electromagnetics – DC/Low Frequency Time and Frequency Mechanical Electromagnetics – RF/Microwave Thermodynamic
	This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01)

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
DIMENSIONAL			
NVLAP Code: 20/D01 ANGULAR	0° to 75° 90°	1.5" 1.9"	Master Angle Blocks Master Square
NVLAP Code: 20/D05 LENGTH & DIAMETER; STEP GAGES Micrometers & Calipers – Outside, Inside, Depth Field calibrations Available ^{Note 4}	0.05 in to 48 in	7.6 μin/in + 6 μin	Comparison to Gage Blocks
Anvil Flatness Field calibrations Available ^{Note 4}	0 in to 1 in	4.5 μin	Optical Flats
Digital & Dial Indicators Field calibrations Available ^{Note 4}	0 in to 0.05 in 0.05 in to 5 in	28 μin 4 μin/in + 44 μin	Dial Indicator Calibrator Horizontal Comparator
Single Axis – Outside	0 in to 5 in	8 μin/in + 6 μin	Horizontal Comparator
Single Axis – Inside Height Measuring Equipment Field calibrations Available ^{Note 4}	0 in to 5 in 0.4 in to 8 in 8 in to 48 in	3 μin/in + 22 μin 5 μin/in + 30 μin 8 μin/in + 4 μin	Horizontal Comparator Gage Blocks

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NVLAP Code: 20/D11 SPHERICAL DIAMETER Plug Gages	0 in to 5 in	8 μ in/in + 6 μ in	Horizontal Comparator
	0 in to 5 in	3 μ in/in + 22 μ in	
NVLAP Code: 20/D13 SURVEYING RODS AND TAPES Rulers	0 in to 12 in	840 μ in	Optical Comparator
NVLAP Code: 20/D14 THREADED PLUG & RING GAGES Plug – Outer Pitch Diameter	0 in to 1 in 1 in to 3 in 3 in to 5 in	79 μ in 84 μ in 94 μ in	ULM w/Thread Wires
Ring – Inner Pitch Diameter	0 in to 2 in	140 μ in	Master Plug Gages

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
ELECTROMAGNETICS – DC/LOW FREQUENCY				
NVLAP Code 20/E02 AC RESISTORS ACI Measuring Equipment Field calibrations Available ^{Note 4}	0 μ A to 220 μ A 0.22 mA to 2.2 mA	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.031 % + 16 nA 0.019 % + 10 nA 0.015 % + 8.0 nA 0.030 % + 12 nA 0.11 % + 65 nA 0.030 % + 40 nA 0.018 % + 35 nA 0.014 % + 35 nA 0.021 % + 0.11 μ A 0.11 % + 0.65 μ A	Fluke 5700A/EP

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (<i>k</i> =2) ^{Note 3,5}	Remarks
Extended Frequency Ranges Field calibrations Available ^{Note 4}	2.2 mA to 22 mA	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.039 % + 0.40 μA 0.019 % + 0.35 μA 0.014 % + 0.35 μA 0.022 % + 0.55 μA 0.12 % + 5.0 μA	Fluke 5700A/EP
	22 mA to 220 mA	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.033 % + 4.0 μA 0.018 % + 3.5 μA 0.015 % + 2.5 μA 0.021 % + 3.5 μA 0.12 % + 10 μA	
	0.22 A to 2.2 A	20 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.027 % + 35 μA 0.046 % + 80 μA 0.70 % + 0.16 mA	
	2.2 A to 11 A	40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.048 % + 0.17 mA 0.096 % + 0.38 mA 0.036 % + 0.75 mA	Fluke 5700A/EP with 5725
	11 A to 20.5 A	45 Hz to 100 Hz 0.1 kHz to 1 kHz 1 kHz to 5 kHz	0.093 % + 5.0 mA 0.12 % + 5.0 mA 2.3 % + 5.0 mA	Fluke 5520A
	29 μA to 330 μA 0.33 mA to 3.3 mA 3.3 mA to 33 mA 33 mA to 330 mA	10 kHz to 30 kHz 10 kHz to 30 kHz 10 kHz to 30 kHz 10 kHz to 30 kHz	1.2 % + 0.40 μA 0.78 % + 0.60 μA 0.31 % + 4.0 μA 0.31 % + 0.20 mA	Fluke 5520A
	Clamp-on Ammeter Toroidal Type Field calibrations Available ^{Note 4}	20 A to 150 A 20 A to 150 A 150 A to 1000 A 150 A to 1000 A	45 Hz to 65 Hz 65 Hz to 440 Hz 45 Hz to 65 Hz 65 Hz to 440 Hz	0.30 % + 0.026 A 0.83 % + 0.047 A 0.35 % + 0.12 A 1.1 % + 0.22 A
				Fluke 5520A w/5500A/Coil

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (<i>k</i> =2) ^{Note 3,5}	Remarks
Clamp-on Ammeter Non-Toroidal Type Field calibrations Available ^{Note 4}	20 A to 150 A	45 Hz to 65 Hz	0.57 % + 0.25 A	
	20 A to 150 A	65 Hz to 440 Hz	1.0 % + 0.25 A	
	150 A to 1000 A	45 Hz to 65 Hz	0.60 % + 0.9 A	
	150 A to 1000 A	65 Hz to 440 Hz	1.3 % + 0.92 A	
AC Current – Measure Field calibrations Available ^{Note 4}	0 μA to 100 μA	10 Hz to 20 Hz	0.4 % + 30 nA	
		20 Hz to 45 Hz	0.15 % + 30 nA	
		45 Hz to 100 Hz	0.063 % + 30 nA	
		100 Hz to 1 kHz	0.063 % + 30 nA	
	100 μA to 1 mA	10 Hz to 20 Hz	0.40 % + 0.2 μA	
		20 Hz to 45 Hz	0.15 % + 0.2 μA	
		45 Hz to 100 Hz	0.062 % + 0.2 μA	
		100 Hz to 5 kHz	0.034 % + 0.2 μA	
	1 mA to 10 mA	10 Hz to 20 Hz	0.40 % + 2 μA	
		20 Hz to 45 Hz	0.15 % + 2 μA	
		45 Hz to 100 Hz	0.062 % + 2 μA	
		100 Hz to 5 kHz	0.034 % + 2 μA	
	10 mA to 100 mA	10 Hz to 20 Hz	0.40 % + 20 μA	
		20 Hz to 45 Hz	0.15 % + 20 μA	
		45 Hz to 100 Hz	0.061 % + 20 μA	
		100 Hz to 5 kHz	0.033 % + 20 μA	
	100 mA to 1 A	10 Hz to 20 Hz	0.40 % + 0.20 mA	
		20 Hz to 45 Hz	0.16 % + 0.20 mA	
		45 Hz to 100 Hz	0.085 % + 0.20 mA	
		100 Hz to 5 kHz	0.10 % + 0.20 mA	
	1 A to 20 A	50 Hz to 100 Hz	0.023 %	
		100 Hz to 300 Hz	0.025 %	
		300 Hz to 1 kHz	0.033 %	
		1 kHz to 3 kHz	0.061 %	
		3 kHz to 4 kHz	0.075 %	
		4 kHz to 5 kHz	0.09 %	
				Fluke Y5020

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
AC Resistance— Measure Field calibrations Available ^{Note 4}	20 Ω to 100 kΩ	1 kHz	0.039 % + 0.01 Ω	Gen Rad 1689
	0.1 Ω to 15 Ω	50 Hz to 100 kHz	0.12 %	Agilent 4284A
	15 Ω to 420 Ω	100 Hz to 100 kHz	0.058 %	
	420 Ω to 32 kΩ	100 Hz to 10 kHz	0.058 %	
	32 kΩ to 320 kΩ	100 Hz to 100 kHz	0.058 %	
	320 kΩ to 10 MΩ	100 Hz to 100 kHz	0.12 %	
	0.1 Ω	1 Hz to 1 MHz	0.17 %	Impedance Standards
	1 Ω	1 Hz to 1 MHz	0.12 %	
	10 Ω	1 Hz to 1 MHz	0.12 %	
	100 Ω	1 Hz to 1 MHz	0.046 %	
	1 kΩ	1 Hz to 1 MHz	0.053 %	
	10 kΩ	1 Hz to 1 MHz	0.13 %	
	100 kΩ	1 Hz to 1 MHz	0.26 %	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
NVLAP Code: 20/E05 DC RESISTANCE Measuring Equipment and Measure Field calibrations Available ^{Note 4}	0 Ω to 10 Ω	20 μΩ/Ω + 50 μΩ	HP3458A w/Resistors
	10 Ω to 100 Ω	15 μΩ/Ω + 0.50 mΩ	
	100 Ω to 1 kΩ	13 μΩ/Ω + 0.50 mΩ	
	1 kΩ to 10 kΩ	12 μΩ/Ω + 5.0 mΩ	
	10 kΩ to 100 kΩ	13 μΩ/Ω + 50 mΩ	
	100 kΩ to 1 MΩ	19 μΩ/Ω + 2.0 Ω	
	1 MΩ to 10 MΩ	62 μΩ/Ω + 100 Ω	
	10 MΩ to 100 MΩ	0.059 % + 1 kΩ	
	100 MΩ to 1 GΩ	0.58 % + 10 kΩ	
	333 μΩ	0.12 %	
Measuring Equipment Field calibrations Available ^{Note 4}	1 mΩ	0.06 %	Guildline 9211
	10 mΩ	0.012 %	
	100 mΩ	0.012 %	
	1 Ω	0.012 %	

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
DC Current – Measuring Equipment	1 GΩ 10 GΩ 100 GΩ 1 TΩ	0.20 % 0.50 % 0.55 % 0.56 %	IET HRRS-Q-8-100k-10kV
Field calibrations Available ^{Note 4}	0 pA to 2 pA 2 pA to 20 pA 20 pA to 200 pA 200 pA to 2 nA 2 nA to 20 nA 20 nA to 200 nA	0.80 % + 10 fA 0.44 % + 10 fA 0.30 % + 30 fA 0.077 % + 100 fA 0.076 % + 1 pA 0.041 % + 10 pA	Keithley 263
	200 nA to 220 μA 220 μA to 2.2 mA 2.2 mA to 22 mA 22 mA to 220 mA 220 mA to 2.2 A 2.2 A to 11 A 11 A to 20.5 A	41 μA/A + 6.0 nA 36 μA/A + 7.0 nA 36 μA/A + 40 nA 49 μA/A + 0.7 μA 0.02 % + 12 μA 0.04 % + 0.48 mA 0.082 % + 0.75 mA	Fluke 5700A/EP Fluke 5700A/EP w/5725A Fluke 5520A
	1 A to 10 A 10 A to 100 A 100 A to 300 A	0.012 % 0.058 % 0.12 %	Guildline 9211 with source
DC Current – Measure	0 to 2 pA 2 pA to 20 pA 20 pA to 200 pA 200 pA to 2 nA 2 nA to 20 nA 20 nA to 200nA 200 nA to 1 μA 1 μA to 10 μA 10 μA to 100 μA 100 μA to 1 mA 1 mA to 10 mA 10 mA to 100 mA	2.1 % + 6.6 fA 1.9 % + 7 fA 1.9 % + 10 fA 0.3 % + 500 fA 0.3 % + 1 pA 0.3 % + 10 pA 26 μA/A + 0.4 pA 26 μA/A + 0.1 nA 28 μA/A + 0.8 nA 29 μA/A + 5.0 nA 29 μA/A + 50 nA 47 μA/A + 0.50 μA	Keithley 617 HP 3458A Opt 002
Field calibrations Available ^{Note 4}			

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
Clamp-on Ammeter Non-Toroidal Type Field calibrations available ^{Note 4}	100 mA to 1 A 1 A to 10 A 10 A to 100 A 100 A to 300 A 20 A to 150 A 150 A to 1000 A	0.11 % + 10 μ A 0.012 % 0.058 % 0.12 % 0.50 % + 0.14 A 0.51 % + 0.5 A	Guildline 9211 with meter Fluke 5520A w/ 5500A/Coil
NVLAP Code: 20/E06 DC VOLTAGE Measure Field calibrations Available ^{Note 4}	0 mV to 100 mV 100 mV to 10 V 10 V to 100 V 100 V to 500 V 500 V to 800 V 800 V to 1 kV 1 kV to 120 kV	10.2 μ V/V + 0.50 μ V 5.2 μ V/V + 0.50 μ V 7.9 μ V/V + 30 μ V 12 μ V/V + 0.10 mV 15 μ V/V + 0.10 mV 21 μ V/V + 0.10 mV 0.014 %	3458A Opt 002 High Voltage Divider
Measuring Equipment Field calibrations Available ^{Note 4}	0 V to 220 mV 220 mV to 2.2 V 2.2 V to 11 V 11 V to 22 V 22 V to 220 V 220 V to 1100 V 1100 V to 36 kV	8.5 μ V/V + 0.5 μ V 5.1 μ V/V + 0.7 μ V 4.0 μ V/V + 2.5 μ V 4.0 μ V/V + 4 μ V 6.2 μ V/V + 40 μ V 7.6 μ V/V + 500 μ V 0.07 %	Fluke 5700A/EP Fluke 5700A/EP w/5725A HV Divider with source

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
ELECTROMAGNETICS – DC/LOW FREQUENCY				
NVLAP Code: 20/E09 LF AC VOLTAGE Measure Field calibrations Available ^{Note 4}	0 mV to 1 mV	0.1 MHz to 1 MHz 1 MHz to 3 MHz 3 MHz to 10 MHz 10 MHz to 20 MHz	1.8 % + 2.4 μ V 3.5 % + 2.4 μ V 9.3 % + 2.4 μ V 23 % + 2.4 μ V	Rhode & Schwarz URE3
	1 mV to 3 mV	0.1 MHz to 1 MHz 1 MHz to 3 MHz 3 MHz to 10 MHz 10 MHz to 20 MHz	0.97 % + 2 μ V 3.5 % + 2 μ V 9.3 % + 2 μ V 23 % + 2 μ V	
	3 mV to 100 mV	0.1 MHz to 1 MHz 1 MHz to 3 MHz 3 MHz to 10 MHz 10 MHz to 20 MHz 20 MHz to 30 MHz	0.91 % + 3 μ V 1.8 % + 3 μ V 2.9 % + 3 μ V 6.9 % + 3 μ V 14 % + 3 μ V	
	0 mV to 10 mV	1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz	0.039 % + 3.0 μ V 0.028 % + 1.0 μ V 0.038 % + 1.0 μ V 0.15 % + 1.0 μ V 0.59 % + 1.0 μ V 4.6 % + 2.0 μ V	Agilent 3458A opt 002
	10 mV to 100 mV	1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz	0.013 % + 4.0 μ V 0.0095 % + 2.0 μ V 0.017 % + 2.0 μ V 0.037 % + 2.0 μ V 0.093 % + 2.0 μ V 0.36 % + 10 μ V	
	100 mV to 1 V	1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz	1.2 % + 10 μ V 0.0098 % + 40 μ V 0.0094 % + 20 μ V 0.017 % + 20 μ V	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
AC Voltage Measuring Equipment Field calibrations Available ^{Note 4}		20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz 1 V to 10 V 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz 10 V to 100 V 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz 100 V to 700 V 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 700 V to 85 kV 60 Hz 0.58 % 0 mV to 2.2 mV 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 0.13 % + 4.0 μ V 0.17 % + 5 μ V	0.036 % + 20 μ V 0.093 % + 20 μ V 0.35 % + 0.1 mV 1.2 % + 0.1 mV 0.0095 % + 0.40 mV 0.0095 % + 0.20 mV 0.017 % + 0.20 mV 0.036 % + 0.20 mV 0.093 % + 0.20 mV 0.35 % + 1.0 mV 1.2 % + 1.0 mV 0.024 % + 4.0 mV 0.024 % + 2.0 mV 0.024 % + 2.0 mV 0.041 % + 2.0 mV 0.14 % + 2.0 mV 0.46 % + 10 mV 1.7 % + 10 mV 0.047 % + 40 mV 0.047 % + 20 mV 0.071 % + 20 mV 0.14 % + 20 mV 0.35 % + 20 mV	HV Divider 5700A/EP

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		100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.33 % + 10 µV 0.47 % + 20 µV 0.58 % + 20 µV	
	2.2 mV to 22 mV	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.042 % + 4.0 µV 0.030 % + 4.0 µV 0.014 % + 4.0 µV 0.030 % + 4.0 µV 0.058 % + 5.0 µV 0.12 % + 10 µV 0.16 % + 20 µV 0.27 % + 20 µV	
	22 mV to 220 mV	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.028 % + 12 µV 0.011 % + 7.0 µV 0.008 % + 7.0 µV 0.021 % + 7.0 µV 0.047 % + 17 µV 0.091 % + 20 µV 0.14 % + 25 µV 0.28 % + 45 µV	
	220 mV to 2.2 V	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.027 % + 40 µV 0.011 % + 15 µV 0.0048 % + 8.0 µV 0.0084 % + 10 µV 0.012 % + 30 µV 0.043 % + 80 µV 0.10 % + 0.20 mV 0.18 % + 0.30 mV	
	2.2 V to 22 V	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz	0.028 % + 0.40 mV 0.01 % + 0.15 mV 0.0049 % + 50 µV 0.0083 % + 0.10 mV 0.012 % + 0.20 mV	5700A/EP

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
		100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.030 % + 0.60 mV 0.11 % + 2.0 mV 0.17 % + 3.2 mV	
	22 V to 220 V	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.028 % + 4.0 mV 0.01 % + 1.5 mV 0.0056 % + 0.60 mV 0.0093 % + 1.0 mV 0.016 % + 2.5 mV 0.090 % + 16 mV 0.44 % + 40 mV 0.8 % + 80 mV	
	220 V to 750 V	30 kHz to 50 kHz 50 kHz to 100 kHz	0.061 % + 11 mV 0.23 % + 45 mV	5700A/EP w/ 5725A
	220 V to 1100 V	40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 30 kHz	0.011 % + 4.0 mV 0.017 % + 6.0 mV 0.067 % + 11 mV	
NVLAP Code 20/E10 LF CAPACITANCE Measure Field calibrations Available ^{Note 4}				
	Up to 10 pF 10 pF to 100 pF 100 pF to 1 μ F 1 μ F to 100 μ F 100 μ F to 1 mF	1 kHz 1 kHz 1 kHz 1 kHz 1 kHz	0.47 % + 0.05 pF 0.058 % + 0.05 pF 0.024 % + 0.05 pF 0.041 % 0.24 %	GenRad 1689
	10 nF to 100 μ F 100 μ F to 12 mF 120 fF to 80 pF 80 pF to 1 μ F 12 fF to 90 pF 90 pF to 100 nF 10 fF to 90 pF 90 pF to 10 nF	100 Hz to 120 Hz 100 Hz to 120 Hz 10 kHz 10 kHz 100 kHz 100 kHz 1 MHz 1 MHz	0.058 % 0.12 % 0.12 % 0.058 % 0.12 % 0.058 % 0.12 % 0.058 %	Agilent 4284A

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Measure Equipment	0.1 nF to 0.5 nF	1 kHz	0.59 pF	
Field calibrations Available ^{Note 4}	0.5 nF to 1.4 μ F	1 kHz	0.12 % + 0.018 pF	Arco SS32
	1 pF	1 kHz - 1 MHz	0.13 %	HP16381A
	10 pF	1 kHz - 1 MHz	0.12 %	HP16382A
	100 pF	1 kHz - 1 MHz	0.12 %	HP16383A
	1000 pF	1 kHz - 1 MHz	0.12 %	HP16384A
	0.19 nF to 1.1 nF	10 Hz to 10 kHz	0.39 % + 7.8 pF	
	1.1 nF to 3.3 nF	10 Hz to 3 kHz	0.39 % + 7.8 pF	
	3.3 nF to 11 nF	10 Hz to 1 kHz	0.20 % + 7.8 pF	
	11 nF to 110 nF	10 Hz to 1 kHz	0.20 % + 78 pF	
	110 nF to 330 nF	10 Hz to 1 kHz	0.20 % + 0.23 nF	
	0.33 μ F to 1.1 μ F	10 Hz to 600 Hz	0.20 % + 0.78 nF	
	1.1 μ F to 3.3 μ F	10 Hz to 300 Hz	0.20 % + 2.3 nF	
	3.3 μ F to 11 μ F	10 Hz to 150 Hz	0.20 % + 7.8 nF	
	11 μ F to 33 μ F	10 Hz to 120 Hz	0.32 % + 23 nF	
	33 μ F to 110 μ F	10 Hz to 80 Hz	0.35 % + 78 nF	
	110 μ F to 330 μ F	DC to 50 Hz	0.37 % + 0.23 μ F	
	0.33 mF to 1.1 mF	DC to 20 Hz	0.37 % + 0.78 μ F	
	1.1 mF to 3.3 mF	DC to 6 Hz	0.35 % + 2.3 μ F	
	3.3 mF to 11 mF	DC to 2 Hz	0.35 % + 7.8 μ F	
	11 mF to 33 mF	DC to 0.6 Hz	0.58 % + 23 μ F	
	33 mF to 110 mF	DC to 0.2 Hz	0.85 % + 78 μ F	
NVLAP Code: 20/E11 LF INDUCTANCE Measure	1 mH to 100 mH	0.1 kHz to 1 kHz	0.04 % + 0.1 μ H	GenRad 1689
Field calibrations Available ^{Note 4}	100 mH to 10 H	0.1 kHz to 1 kHz	0.057 % + 1.4 μ H	
	5 μ H to 5 mH	400 Hz	0.12 %	
	5 mH to 10 H	400 Hz	0.058 %	
	120 μ H to 20 mH	100 Hz to 120 Hz	0.12 %	
	20 mH to 10 H	100 Hz to 120 Hz	0.058 %	
	1 μ H to 1 mH	1 kHz	0.12 %	
	5 nH to 120 μ H	10 kHz	0.12 %	
	120 μ H to 100 mH	10 kHz	0.058 %	

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NVLAP LAB CODE 200990-0

Scope Revised: 2012-12-06

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
Measuring Equipment Field calibrations Available ^{Note 4}	100 mH	1 kHz	0.14 %	Standard Inductor
NVLAP Code: 20/E12 LF POWER/ENERGY Power – Measuring Equipment (for current range listed below)				
DC Power				
0.33 mA to 330 mA	11 µW to 1.1 mW 1.1 mW to 110 mW 0.11W to 110 W 110 W to 330 W	DC DC DC DC	0.024 % 0.027 % 0.024 % 0.018 %	Fluke 5520A
0.33 A to 3 A	11 W to 110 mW 0.11 W to 990 W 1 W to 3 kW	DC DC DC	0.044 % 0.053 % 0.0096 %	
3 A to 20.5 A	0.099 W to 0.99 W 0.99 W to 6.8 kW 6.8 W to 20.5 kW	DC DC DC	0.088 % 0.07 % 0.04 %	
AC Power ^{Note 8} (PF = 1)				
3.3 mA to 9 mA	0.11 mW to 3 mW 3 mW to 9 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.13 % 0.077 %	
9 mA to 33 mA	0.3 mW to 10 mW 10 mW to 33 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.089 % 0.077 %	
33 mA to 90 mA	1 mW to 30 mW 30 mW to 90 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.071 % 0.057 %	
90 mA to 330 mA	3.0 mW to 100 mW 100 mW to 300 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.089 % 0.078 %	
0.33 A to 0.9 A	11 mW to 300 mW 300 mW to 900 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.071 % 0.081 %	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
0.9 A to 2.2 A	30 mW to 720 mW 720 mW to 2 kW	10 Hz to 65 Hz 10 Hz to 65 Hz	0.089 % 0.079 %	
2.2 A to 4.5 A	80 mW to 1.4 W 1.4 W to 4.5 kW	10 Hz to 65 Hz 10 Hz to 65 Hz	0.088 % 0.18 %	
4.5 A to 20.5 A	150 mW to 6.7 W 6.7 W to 20 kW	10 Hz to 65 Hz 10 Hz to 65 Hz	0.17 % 0.17 %	
NVLAP Code: 20/E15 PHASE METERS Measuring Equipment Field calibrations Available ^{Note 4}	0 ° to 179.99 °	10 Hz to 65 Hz 65 Hz to 500 Hz 500 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.10 ° 0.20 ° 0.40 ° 1.8 ° 3.6 ° 7.3 °	Fluke 5520A

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
TIME AND FREQUENCY			
NVLAP Code: 20/F01 FREQUENCY DISSEMINATION Source and Measure		Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise, and gating errors.	
In-Lab	10 MHz	3.7×10^{-12}	Fluke 910R
Field Service ^{Note 4}	10 MHz	3.8×10^{-9}	HP 53132A Counter

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

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Measured Parameter	Range	Frequency Range	Uncertainty (k=2) ^{Note 3, 5}	Remarks
NVLAP Code: 20/F03 SIGNAL CHARACTERIZATION AM Depth – Measure Field calibrations available ^{Note 4}			Where AM is the amplitude modulation depth of the measured signal. Uncertainty is listed in % of AM depth. Modulation rate shown in left column.	
50 Hz to 10 kHz	5 % to 40 % 40 % to 99 %	150 kHz to 10 MHz	(0.021 AM + 0.014) % (0.021 AM + 0.14) %	Agilent 8902A With 11722A
20 Hz to <50 Hz	5 % to 40 % 40 % to 99 %	150 kHz to 10 MHz	(0.031 AM + 0.014) % (0.031 AM + 0.14) %	
50 Hz to 50 kHz	5 % to 40 % 40 % to 99 %	10 MHz to 1.3 GHz	(0.011 AM + 0.014) % (0.011 AM + 0.14) %	
50 Hz to 50 kHz	5 % to 40 % 40 % to 99 %	1.3 GHz to 26.5 GHz	(0.016 AM + 0.014) % (0.016 AM + 0.14) %	Agilent 8902A With 11722A, 11792A, and 11793A
(20 Hz to 50 Hz) or (50 kHz to 100 kHz)	5 % to 40 % 40 % to 99 %	10 MHz to 26.5 GHz 10 MHz to 26.5 GHz	(0.031 AM + 0.014) % (0.031 AM + 0.14) %	
FM Modulation – Measure Field calibrations available ^{Note 4}			Where FM is the frequency modulation peak deviation of the measured signal. Modulation rate shown in left column.	
20 Hz to 10 kHz	0 kHz to 4 kHz 4 kHz to 40 kHz 40 kHz to 400 kHz	250 kHz to 10 MHz	(0.021 FM + 20) Hz (0.021 FM + 22) Hz (0.021 FM + 100) Hz	Agilent 8902A With 11722A
50 Hz to 100 kHz	0 kHz to 4 kHz 4 kHz to 40 kHz 40 kHz to 400 kHz	100 MHz to 26.5 GHz	(0.011 FM + 20) Hz (0.011 FM + 22) Hz (0.011 FM + 100) Hz	Agilent 8902A With 11722A, 11792A, and 11793A
20 Hz to <50 Hz	0 kHz to 4 kHz 4 kHz to 40 kHz 40 kHz to 400 kHz		(0.050 FM + 20) Hz (0.050 FM + 22) Hz (0.050 FM + 100) Hz	
>100 kHz to 200 kHz	0 kHz to 4 kHz 4 kHz to 40 kHz 40 kHz to 400 kHz		(0.050 FM + 100) Hz (0.050 FM + 100) Hz (0.050 FM + 100) Hz	

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Measured Parameter	Range	Frequency Range	Uncertainty (k=2) ^{Note 3,5}	Remarks
Phase Modulation – Measure Field calibrations available ^{Note 4}				Where PM is the phase modulation peak phase deviation of the measured signal. Modulation rate shown in left column.
200 Hz to 10 kHz	0 rad to < 4 rad 4 rad to < 40 rad 40 rad to 400 rad	150 kHz to 10 MHz	(0.042PM + 0.030) rad (0.042PM + 0.030) rad (0.042PM + 0.10) rad	Agilent 8902A with 11722A
200 Hz to 20 kHz	0 rad to < 4 rad 4 rad to < 40 rad 40 rad to 400 rad	10 MHz to 26.5 GHz	(0.036PM + 0.030) rad (0.036PM + 0.030) rad (0.036PM + 0.10) rad	8902A with 1722A, 11792A, And 11793A
Harmonic Distortion Field calibrations available ^{Note 4}	0 dBc to -80 dBc	30 Hz to 6.5 GHz 6.5 GHz to 22 GHz 22 GHz to 26.5 GHz	1.7 dB 2.6 dB 3.3 dB	Agilent 8566B
Total Harmonic Distortion Field calibrations available ^{Note 4}	0 dB to -80 dB	20 Hz to 20 kHz 20 kHz to 100 kHz	1.2 dB 2.3 dB	Agilent 8903B
AM Total Harmonic Distortion Field calibrations available ^{Note 4}	0 dB to -80 dB	20 Hz to 100 kHz	2.7 dB	
Total Harmonic Distortion 5 Hz to 600 kHz Field calibrations available ^{Note 4}				
Input Voltage Range < 30 V	100 % to 0.3 % 0.1 %	10 Hz to 1 MHz 1 MHz to 3 MHz 10 Hz to 20 Hz 20 Hz to 30 Hz 30 Hz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1.2 MHz	3 % 6 % 12 % 6 % 3 % 6 % 12 %	Agilent 334A

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter	Range	Frequency Range	Uncertainty (k=2) ^{Note 3,5}	Remarks
Input Voltage Range > 30 V	100 % to 0.3 %	10 Hz to 300 kHz 300 kHz to 500 kHz 500 kHz to 3 MHz	3 % 6 % 12 %	
	0.1 %	20 Hz to 30 Hz 30 Hz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1.2 MHz	12 % 3 % 6 % 12 %	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) ^{Note 3,5}	Remarks
NVLAP Code: 20/F04 PULSE WAVEFORM Rise time (Generate) Field calibrations Available ^{Note 4}	≥ 13 ps	2.4 ps	Pulser
Rise Time (Measure)	≥ 17 ps	3.9 ps + 2 %	Sampling System
MECHANICAL			
NVLAP Code: 20/M06 FORCE Force Measuring Equipment	1 lbf to 100 lbf	0.06 %	Deadweight
NVLAP Code: 20/M08 MASS Balances & Scales Field calibrations Available ^{Note 4}	5 mg to 500 mg 500 mg to 5 g 5 g to 10 g 10 g to 20 g 20 g to 30 g 30 g to 50 g 50 g to 100 g 100 g to 200 g 200 g to 500 g	0.12 mg 0.13 mg 0.14 mg 0.16 mg 0.19 mg 0.28 mg 0.52 mg 1.0 mg 1.7 mg	ASTM Class 1 & 2 Weights

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
	500 g to 1 kg 1 kg to 2 kg 2 kg to 3 kg 3 kg to 4 kg 4 kg to 5 kg 5 kg to 10 kg 10 kg to 20 kg 1 lb to 500 lb	5.1 mg 1.3 mg 1.4 mg 1.5 mg 2.8 mg 13 mg 2 g 0.01 %	NIST Class F Weights
NVLAP Code: 20/M11 VIBRATION Acceleration	20 Hz to 100 Hz 100 Hz to 2.5 kHz 2.5 kHz to 10 kHz	2.1 % 1.6 % 2.9 %	Standard Accelerometer
NVLAP Code: 20/M15 TORQUE Torque - Measure Field calibrations Available ^{Note 4}	0.5 ozf-in to 15 ozf-in 15 ozf-in to 200 ozf-in 4 lbf-in to 80 lbf-in 80 lbf-in to 1000 lbf-in 20 lbf-ft to 2000 lbf-ft 1000 lbf-ft to 5000 lbf-ft	0.83 % 0.40 % 0.43 % 0.40 % 0.40 % 1.0 %	Wheel w/ weight Torque Calibrator
Torque - Measuring Equipment	0.5 ozf-in to 16 ozf-in 1 lbf-in to 40 lbf-in 40 lbf-in to 260 lbf-in 260 lbf-in to 3000 lbs-in	0.83 % 0.075 % 0.074 % 0.066 %	Torque Wheel with Weights Torque Arm with Weights
ELECTROMAGNETICS – RF/MICROWAVE			
NVLAP Code: 20/R02 VSWR Field calibrations available ^{Note 4}	(Rho)	(Rho)	VSWR Bridge
10 MHz to 18 GHz	0.022 to 0.1 0.1 to 0.2 0.2 to 0.3 0.3 to 0.4	0.022 0.027 0.033 0.042	

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
NVLAP Code: 20/R11 RF-DC VOLTAGE /CURRENT CONVERTERS SineWave Flatness Field calibrations available ^{Note 4}	10 Hz to 1 MHz 1 MHz to 10 MHz 10 MHz to 30 MHz 30 MHz to 50 M Hz 50 MHz to 80 MHz 80 MHz to 100 MHz	0.066 % 0.10 % 0.18 % 0.41 % 0.71 % 0.84 %	Thermal Converter/HP3458A
NVLAP Code: 20/R13 RF/MICROWAVE ATTENUATORS Relative Tuned RF Power Field calibrations available ^{Note 4}	250 kHz to 18 GHz 0 dB to -20 dB -20 dB to -40 dB -40 dB to -60 dB -60 dB to -80 dB -80 dB to -100 dB -100 dB to -120 dB	0.11 dB 0.13 dB 0.16 dB 0.20 dB 0.30 dB 0.32 dB	Agilent 8902A with 11722A, 11793A
NVLAP Code: 20/R17 RF/MICROWAVE POWER METERS Absolute RF Power Field calibrations available ^{Note 4}	50 MHz 1 mW Reference 100 kHz to 2.6 GHz + 30 dBm to +20 dBm +20 dBm to +10 dBm +10 dBm to 0 dBm 0 dBm to -10 dBm -10 dBm to -20 dBm 2.6 GHz to 12 GHz + 30 dBm to +20 dBm +20 dBm to +10 dBm	0.63 % (0.03 dBm) 0.07 dBm 0.06 dBm 0.07 dBm 0.06 dBm 0.10 dBm 0.14 dBm 0.13 dBm	Agilent 478A- H75, 432A, and 3458A Agilent 8902A with 11722A Agilent 8902A w/ 11722A, 11792A & 11793A

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
12 GHz to 18 GHz	+10 dBm to 0 dBm	0.13 dBm	
	0 dBm to -10 dBm	0.13 dBm	
	-10 dBm to -20 dBm	0.15 dBm	
	+30 dBm to +20 dBm	0.17 dBm	
	+20 dBm to +10 dBm	0.16 dBm	
	+10 dBm to 0 dBm	0.16 dBm	
	0 dBm to -10 dBm	0.16 dBm	
	-10 dBm to -20 dBm	0.17 dBm	
	THERMODYNAMIC		
NVLAP Code: 20/T02 HUMIDITY Measuring Equipment	10 % to 90 %	1.3 %	Vaisala HMI41/HMP46 with Source
Measure Field calibrations Available ^{Note 4}	10 % to 90 %	1.3 %	Vaisala HMI41/HMP46
NVLAP Code: 20/T03 LABORTORY THERMOMETERS Measure Field calibrations Available ^{Note 4}	-195 °C to 0 °C 0 °C to 420 °C 420 °C to 660 °C	0.011 °C + 0.001 % 0.025 °C + 0.001 % 0.034 °C + 0.001 %	Hart 5628 w/ Black Stack Hart 5628 w/Black Stack Hart 5628 w/Black Stack
Measure	-195 °C to 0 °C 0 °C to 420 °C 420 °C to 660 °C	0.010 °C + 0.001 % 0.020 °C + 0.001 % 0.028 °C + 0.001 %	Hart 5628 w/ Hart 1575 Hart 5628 w/ Hart 1575 Hart 5628 w/ Hart 1575
Measuring Equipment Field calibrations Available ^{Note 4}	-25 °C to 140 °C 140 °C to 600 °C	0.06 °C 0.03 °C	Hart 5628 w/Hart Well Hart 5628 w/Hart Well
NVLAP Code: 20/T05 PRESSURE Absolute Measure & Measuring Equipment	25 to 500 psia 0 to 25 psia	0.0067 % + 0.001 psia 0.0019 psia	Ruska 7250xi

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
Gage Pressure Measure & Measuring Equipment – Pneumatic	-36 in H ₂ O to -22 in H ₂ O -22 in H ₂ O to 22 in H ₂ O 22 in H ₂ O to 60 in H ₂ O 60 in H ₂ O to 72 in H ₂ O 72 in H ₂ O to 804 in H ₂ O -14.7 psig to 25 psig 25 psig to 500 psig 500 psig to 10000 psig 5 psig to 15 000 psig 15 000 psig to 30 000 psig	0.0090% + 150 μ in H ₂ O 0.002 in H ₂ O 0.0090% + 150 μ in H ₂ O 0.0065 in H ₂ O 0.0090% + 150 μ in H ₂ O 0.0016 psig 0.0065% 2.9 psig 0.018 % 35 psig	DHI PPC4-ui Ruska 7250xi Mensor 2101 Ametek T-150 DWT Pressure Transducer
NVLAP Code: 20/T06 RADIATION THERMOMETRY Infrared Temperature – Measuring Equipment	-15 °C to 0 °C 0 °C to 50 °C 50 °C to 100 °C 100 °C to 120 °C 120 °C to 200 °C 200 °C to 350 °C 350 °C to 500 °C	0.98 °C 0.67 °C 0.71 °C 0.76 °C 0.99 °C 1.7 °C 2.3 °C	Hart Black Body
NVLAP Code: 20/T08 THERMOCOUPLES & PYROMETER INDICATORS Electrical Calibration of Thermocouple Devices Field calibrations Available ^{Note 4}	Type J -210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C Type K -200 °C to -100 °C -100 °C to -25 °C	0.23 °C 0.16 °C 0.15 °C 0.17 °C 0.20 °C 0.28 °C 0.17 °C	Fluke 5520A

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3,5}	Remarks
Type T	-25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.16 °C 0.23 °C 0.33 °C	
Type E	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.50 °C 0.20 °C 0.16 °C 0.15 °C	
Type R	-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C	0.40 °C 0.16 °C 0.15 °C 0.16 °C 0.19 °C	
Type S	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.45 °C 0.29 °C 0.28 °C 0.37 °C	
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.33 °C 0.20 °C 0.18 °C 0.18 °C 0.23 °C	
Type B	600 °C to 800 °C 800 °C to 1 000 °C 1000 °C to 1550 °C 1550 °C to 1820 °C	0.36 °C 0.29 °C 0.25 °C 0.28 °C	

END

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Wm. R. Mull
For the National Institute of Standards and Technology



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Notes

Note 1: A Calibration and Measurement Capability (CMC) is a description of the best result of a calibration or measurement (result with the smallest uncertainty of measurement) that is available to the laboratory's customers under normal conditions, when performing more or less routine calibrations of nearly ideal measurement standards or instruments. The CMC is described in the laboratory's scope of accreditation by: the measurement parameter/device being calibrated, the measurement range, the uncertainty associated with that range (see note 3), and remarks on additional parameters, if applicable.

Note 2: Calibration and Measurement Capabilities are traceable to the national measurement standards of the U.S. or to the national measurement standards of other countries and are thus traceable to the internationally accepted representation of the appropriate SI (Système International) unit.

Note 3: The uncertainty associated with a measurement in a CMC is an expanded uncertainty using a coverage factor, $k = 2$, with a level of confidence of approximately 95 %. Units for the measurand and its uncertainty are to match. Exceptions to this occur when marketplace practice employs mixed units, such as when the artifact to be measured is labeled in non-SI units and the uncertainty is given in SI units (Example: 5 lb weight with uncertainty given in mg).

Note 3a: The uncertainty of a specific calibration by the laboratory may be greater than the uncertainty in the CMC due to the condition and behavior of the customer's device and specific circumstances of the calibration. The uncertainties quoted do not include possible effects on the calibrated device of transportation, long term stability, or intended use.

Note 3b: As the CMC represents the best measurement results achievable under normal conditions, the accredited calibration laboratory shall not report smaller uncertainty of measurement than that given in a CMC for calibrations or measurements covered by that CMC.

Note 3c: As described in Note 1, CMCs cover calibrations and measurements that are available to the laboratory's customers under *normal conditions*. However, the laboratory may have the capability to offer special tests, employing special conditions, which yield calibration or measurement results with lower uncertainties. Such special tests are not covered by the CMCs and are outside the laboratory's scope of accreditation. In this case, NVLAP requirements for the labeling, on calibration reports, of results outside the laboratory's scope of accreditation apply. These requirements are set out in Annex A.1.h. of NIST Handbook 150, Procedures and General Requirements.

Note 4: Uncertainties associated with field service calibration may be greater as they incorporate on-site environmental contributions, transportation effects, or other factors that affect the measurements. (This note applies only if marked in the body of the scope.)

Note 5: Values listed with percent (%) are percent of reading or generated value unless otherwise noted.

Note 6: NVLAP accreditation is the formal recognition of specific calibration capabilities. Neither NVLAP nor NIST guarantee the accuracy of individual calibrations made by accredited laboratories.

Note 7: See [NIST Handbook 150](#) for further explanation of these notes.

Note 8: The uncertainties shown are for the most favorable conditions. There is an increase in uncertainty that corresponds to the laboratory's AC voltage and current uncertainties at different frequencies other than the ones shown. Power factors (PF) other than the one shown contribute to the power uncertainty. PF is related to the cosine of phase. Therefore, uncertainties track the laboratory's phase uncertainty closely at PF near one, but are magnified heavily as PF approaches zero. The lab may also report reactive power, apparent power, and power factor under this accreditation. If needed, contact laboratory for more information regarding uncertainties at frequency and power factor combinations other than the ones shown.

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