



National Voluntary Laboratory Accreditation Program



CALIBRATION LABORATORIES

NVLAP LAB CODE 200903-0

Scope Revised: 2013-01-22

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Transcat – Charlotte 8334 Arrowridge Blvd., Suite B Charlotte, NC 28273 Mr. Brian Samuelson Phone: 704-529-6154; Fax: 704-529-3590 E-mail: bsamuelson@transcat.com URL: http://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)
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
DIMENSIONAL			
NVLAP Code: 20/D01 ANGULAR Angles	0° to 75° 90°	5.3" 1.3"	Angle Blocks Master Square
NVLAP Code: 20/D03 GAGE BLOCKS	0.05 in to 1 in 1 in to 4 in 1 mm to 10 mm 10 mm to 100 mm	1.5 μ in + 1.4 μ in/in 0.7 μ in + 1.9 μ in/in 0.032 μ m + 3.0 μ m/m 0.07 μ m + 1.5 μ m/m	Federal Comparator and Grade 1 Blocks
NVLAP Code: 20/D05 LENGTH and DIAMETER Micrometers and Calipers – Outside, Inside, Depth Field calibrations available ^{Note 4}	0 in to 8 in 8 in to 48 in	20 μ in + 5 μ in/in 13 μ in + 7 μ in/in	Comparison to Gage Blocks
Anvil Flatness Field calibrations available ^{Note 4}	0 in to 1 in	6.4 μ in	Optical Flats
Length Measurement – Single Axis	0 in to 6 in 6 in to 10 in	9 μ in + 4 μ in/in 2 μ in + 5 μ in/in	Supermicrometer and Gage Blocks

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Outside Diameter – Cylindrical Gages	0.01 in to 1 in	30 μ in	Laser Micrometer
Digital and Dial Indicators	0 in to 6 in	4 μ in + 7 μ in/in	Comparison to Gage Blocks
Height Measuring Equipment and Measure	0 in to 8 in 8 in to 44 in	30 μ in + 2 μ in/in 10 μ in + 4 μ in/in	Comparison to Gage Blocks
Parallelism & Straightness	0 in to 3 in 3 in to 24 in	20 μ in + 3.2 μ in/in 30 μ in + 3.2 μ in/in	Gage Amp & Surface Plate
Optical X-Y X Axis Y Axis	0 in to 9 in 0 in to 4 in	260 μ in 260 μ in	Optical Comparator
Optical Flats	0 in to 3 in	6.4 μ in	Interferometry with Optical Flats
Optical Area X Axis Y Axis Magnification X-Y Axis	0.05 in to 12 in 0.05 in to 12 in 10x to 50x 0.05 in to 12 in	190 μ in 190 μ in 310 μ in 260 μ in	Glass Grid Cylindrical Square
NVLAP Code: 20/D11 SPHERICAL DIAMETER; PLUG/RING GAGES			
Outer Diameter – Plug Gages	0 in to 1 in	30 μ in	Laser Micrometer
Laser Micrometers	0 in to 1 in	13 μ in + 3.2 μ in/in	Master Pins
NVLAP Code: 20/D13 SURVEYING RODS and TAPES			
Tapes and Rulers	0 ft to 100 ft	0.0018 in	Glass Grid

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
ELECTROMAGNETICS – DC/LOW FREQUENCY				
NVLAP Code: 20/E02 AC RESISTORS and CURRENT AC Current – Measuring Equipment Field calibrations available <small>Note 4</small>	0 μA to 220 μA	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	0.028 % + 16 nA 0.019 % + 10 nA 0.014 % + 8.0 nA 0.030 % + 12 nA 0.11 % + 65 nA	Fluke 5700A-EP
	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	0.027 % + 40 nA 0.017 % + 35 nA 0.014 % + 35 nA 0.021 % + 110 nA 0.11 % + 650 nA	
	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	0.028 % + 400 nA 0.018 % + 350 nA 0.014 % + 350 nA 0.021 % + 550 nA 0.11 % + 5 μA	
	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	0.028 % + 4 μA 0.018 % + 3.5 μA 0.014 % + 2.5 μA 0.022 % + 3.5 μA 0.11 % + 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 0.047 % + 80 μA 0.71 % + 160 μA	
	2.2 A to 11 A	20 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.027 % + 170 μA 0.098 % + 380 μA 0.37 % + 750 μA	Fluke 5700A-EP with 5725A

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
Extended Frequency Ranges Field calibrations available <small>Note 4</small>	11 A to 20.5 A	45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz	0.095% + 3.9 mA 0.12% + 3.9 mA 2.3% + 3.9 mA	Fluke 5520A
	29 μ A to 330 μ A 330 μ A 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 % + 0.31 μ A 0.78 % + 0.47 μ A 0.31 % + 3.1 μ A 0.31 % + 0.16 mA	Fluke 5520A
Clamp-on Ammeter Toroidal Type Field calibrations available <small>Note 4</small>	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 % + 26 mA 0.83 % + 47 mA 0.35 % + 0.12 A 1.1 % + 0.22 A	Fluke 5520A with 5500A/Coil
Clamp-on Ammeter Non-Toroidal Type Field calibrations available <small>Note 4</small>	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	0.57 % + 0.25 A 1.0 % + 0.25 A 0.60 % + 0.90 A 1.3 % + 0.92 A	Fluke 5520A with 5500A/Coil
AC Current – Measure Field calibrations available <small>Note 4</small>	0 μ A to 100 μ A 100 μ A to 1 mA 1 mA to 10 mA 10 mA to 100 mA	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz 10 Hz to 20 Hz 20 Hz to 45 Hz	0.46 % + 30 nA 0.17 % + 30 nA 0.072 % + 30 nA 0.072 % + 30 nA 0.46 % + 200 nA 0.17 % + 200 nA 0.071 % + 200 nA 0.038 % + 200 nA 0.46 % + 2 μ A 0.17 % + 2 μ A 0.071 % + 2 μ A 0.038 % + 2 μ A 0.46 % + 20 μ A 0.17 % + 20 μ A	Agilent 3458A opt 002

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		45 Hz to 100 Hz 100 Hz to 5 kHz	0.071 % + 20 μA 0.037 % + 20 μA	
	100 mA to 1 A	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz	0.46 % + 200 μA 0.19 % + 200 μA 0.097 % + 200 μA 0.12 % + 200 μA	
	1 A to 2 A 2 A to 20 A	50 Hz to 1 kHz 50 Hz to 1 kHz	0.12 % + 200 μA 0.12 % + 300 μA	Ballantine 1625A with Agilent 3458A

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
NVLAP Code: 20/E05 DC RESISTANCE and CURRENT DC Resistance – Measuring Equipment and Measure Field calibrations available <small>Note 4</small>	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω	18 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 500 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 500 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 5 m Ω 14 $\mu\Omega/\Omega$ + 50 m Ω 19 $\mu\Omega/\Omega$ + 2 Ω 62 $\mu\Omega/\Omega$ + 100 Ω 590 $\mu\Omega/\Omega$ + 1 k Ω 0.58 % + 10 k Ω	HP 3458A with Decade Resistor
DC Resistance – Measuring Equipment	100 $\mu\Omega$ 1 m Ω 10 m Ω 100 m Ω 1 Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω 1 G Ω to 10 G Ω 10 G Ω to 100 G Ω 100 G Ω to 1 T Ω	810 $\mu\Omega/\Omega$ 500 $\mu\Omega/\Omega$ 200 $\mu\Omega/\Omega$ 88 $\mu\Omega/\Omega$ 100 $\mu\Omega/\Omega$ 0.08 % 0.25 % 0.41 % 0.84 % 2.5 %	Fixed Resistors IET HRRS-B-7-100k-5kV

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DC Current – Measuring Equipment and Measure Field calibrations available <small>Note 4</small>	0 μA to 100 μA 100 μA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 300 A	26 μA/A + 0.8 nA 26 μA/A + 5 nA 26 μA/A + 50 nA 41 μA/A + 500 nA 130 μA/A + 10 μA 0.058 %	Agilent 3458A with Current Source L&N 4363 shunt with DMM
DC Current – Measuring Equipment Field calibrations available <small>Note 4</small>	0.22 A to 2.2 A 2.2 A to 11 A 11 A to 20.5 A	92 μA/A + 12 μA 280 μA/A + 480 μA 780 μA/A + 750 μA	Fluke 5700A-EP With 5725A Fluke 5520A
Clamp-on Ammeter Non-Toroidal Type Field calibrations available <small>Note 4</small>	20 A to 150 A 150 A to 1000 A	0.50 % + 0.14 A 0.51 % + 0.5 A	Fluke 5520A with 5500A/Coil
NVLAP Code: 20/E06 DC VOLTAGE DC Voltage – Measure Field calibrations available <small>Note 4</small>	50 kV to 120 kV	0.083 %	High Voltage Divider
DC Voltage – Measure Equipment Field calibrations available <small>Note 4</small>	2.2 V to 11 V 11 V to 22 V 22 V to 220 V 220 V to 1100 V	4.1 μV/V + 2.5 μV 4.0 μV/V + 4.0 μV 6.3 μV/V + 40 μV 7.7 μV/V + 400 μV	Fluke 5700A-EP
DC Voltage – Measure Equipment and Measure Field calibrations available <small>Note 4</small>	0 V 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 1000 V 1 kV to 2 kV 2 kV to 20 kV 20 kV to 50 kV	7.1 μV/V + 0.5 μV 5.0 μV/V + 0.5 μV 7.6 μV/V + 30 μV 11 μV/V + 100 μV 14 μV/V + 100 μV 21 μV/V + 100 μV 0.051 % + 0.4 V 0.049 % + 4.0 V 0.082 %	HP 3458A opt 002 with Fluke 5700A Vitrek 4600A with source HV Divider with source

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NVLAP Code: 20/E09				
LF AC VOLTAGE				
AC High Voltage – Measure	700 V to 2 kV	20 Hz to 100 Hz	0.086 % + 2 V	Vitrek 4600A
Field calibrations available <small>Note 4</small>	700 V to 2 kV	100 Hz to 400 Hz	0.53 % + 2 V	
	2 kV to 20 kV	20 Hz to 100 Hz	0.34 % + 20 V	
	20 kV to 85 kV	60 Hz	0.48 %	HV Voltage Divider
AC Voltage – Measure	0 mV to 10 mV	1 Hz to 40 Hz	0.035 % + 3 μ V	Agilent 3458A opt
Field calibrations available <small>Note 4</small>		40 Hz to 1 kHz	0.026 % + 1.1 μ V	002
		1 kHz to 20 kHz	0.034 % + 1.1 μ V	
		20 kHz to 50 kHz	0.10 % + 1.1 μ V	
		50 kHz to 100 kHz	0.51 % + 1.1 μ V	
		100 kHz to 300 kHz	4.0 % + 2 μ V	
	10 mV to 100 mV	1 Hz to 40 Hz	0.012 % + 4 μ V	
		40 Hz to 1 kHz	0.0085 % + 2 μ V	
		1 kHz to 20 kHz	0.015 % + 2 μ V	
		20 kHz to 50 kHz	0.030 % + 2 μ V	
		50 kHz to 100 kHz	0.081 % + 2 μ V	
		100 kHz to 300 kHz	0.31 % + 10 μ V	
		300 kHz to 1 MHz	1.0 % + 10 μ V	
	100 mV to 1 V	1 Hz to 40 Hz	0.0089 % + 40 μ V	
		40 Hz to 1 kHz	0.0085 % + 20 μ V	
		1 kHz to 20 kHz	0.015 % + 20 μ V	
		20 kHz to 50 kHz	0.031 % + 20 μ V	
		50 kHz to 100 kHz	0.081 % + 20 μ V	
		100 kHz to 300 kHz	0.30 % + 100 μ V	
		300 kHz to 1 MHz	1.0 % + 100 μ V	
	1 V to 10 V	1 Hz to 40 Hz	0.0085 % + 0.4 mV	
		40 Hz to 1 kHz	0.0086 % + 0.2 mV	
		1 kHz to 20 kHz	0.015 % + 0.2 mV	
		20 kHz to 50 kHz	0.031 % + 0.2 mV	
		50 kHz to 100 kHz	0.081 % + 0.2 mV	
		100 kHz to 300 kHz	0.30 % + 1 mV	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
AC Voltage – Measuring Equipment Field calibrations available <small>Note 4</small>	10 V to 100 V	300 kHz to 1 MHz 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	1.0 % + 1 mV 0.021 % + 4 mV 0.021 % + 2 mV 0.021 % + 2 mV 0.036 % + 2 mV 0.12 % + 2 mV 0.40 % + 10 mV 1.5 % + 10 mV	
	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	0.041 % + 40 mV 0.041 % + 20 mV 0.061 % + 20 mV 0.12 % + 20 mV 0.35 % + 20 mV	
	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 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.036 % + 4 μ V 0.033 % + 4 μ V 0.033 % + 4 μ V 0.033 % + 4 μ V 0.057 % + 5 μ V 0.13 % + 10 μ V 0.20 % + 20 μ V 0.31 % + 20 μ V	Fluke 5700A-EP
	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	0.044 % + 4 μ V 0.031 % + 4 μ V 0.015% + 4 μ V 0.032 % + 4 μ V 0.060 % + 5 μ V 0.066 % + 10 μ V 0.17 % + 20 μ V 0.31 % + 20 μ V	
	22 mV to 220 mV	10 Hz to 20 Hz 20 Hz to 40 Hz	0.029 % + 12 μ V 0.011 % + 7 μ V	

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		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	0.0087 % + 7 μ V 0.021 % + 7 μ V 0.048 % + 17 μ V 0.094 % + 20 μ V 0.15 % + 25 μ V 0.28 % + 45 μ V	
	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	0.028 % + 40 μ V 0.010 % + 15 μ V 0.0049 % + 8 μ V 0.0083 % + 10 μ V 0.012 % + 30 μ V 0.044 % + 80 μ V 0.01 % + 200 μ V 0.18 % + 300 μ V	
	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 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.028 % + 0.4 mV 0.01 % + 0.15 mV 0.005 % + 50 μ V 0.0084 % + 0.1 mV 0.012 % + 0.2 mV 0.031 % + 0.6 mV 0.11 % + 2 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 mV 0.015 % + 1.5 mV 0.0057 % + 0.6 mV 0.0095 % + 1 mV 0.017 % + 2.5 mV 0.092 % + 16 mV 0.45 % + 40 mV 0.82 % + 80 mV	
	220 V to 1100 V	40 Hz to 1 kHz 1 kHz to 20 kHz	0.011 % + 4 mV 0.017 % + 6 mV	Fluke 5720A/5725A

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		20 kHz to 30 kHz	0.061 % + 11 mV	
	220 V to 750 V	30 kHz to 50 kHz 50 kHz to 100 kHz	0.061 % + 11 mV 0.24 % + 45 mV	
NVLAP Code: 20/E10 LF CAPACITANCE Capacitance – Measure Field calibrations available <small>Note 4</small>	0 pF 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 1000 μ F	60 Hz to 1 kHz	0.47 % + 0.05 pF	GenRad 1689M
	0.1 nF to 0.5 nF 0.5 nF to 1400 nF 0.19 nF to < 1.1 nF 1.1 nF to < 3.3 nF 3.3 nF to < 11 nF 11 nF to < 110 nF 110 nF to < 330 nF 0.33 μ F to < 1.1 μ F 1.1 μ F to < 3.3 μ F 3.3 μ F to < 11 μ F 11 μ F to < 33 μ F 33 μ F to < 110 μ F 110 μ F to < 330 μ F 0.33 mF to < 1.1 mF 1.1 mF to < 3.3 mF 3.3 mF to < 11 mF 11 mF to < 33 mF 33 mF to < 110 mF	100 Hz to 1 kHz 100 Hz to 1 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 100 Hz to 1 kHz 100 Hz to 1 kHz 10 Hz to 10 kHz 10 Hz to 600 Hz 10 Hz to 300 Hz 10 Hz to 150 Hz 10 Hz to 120 Hz 10 Hz to 80 Hz DC to 50 Hz DC to 20 Hz DC to 2 Hz DC to 6 Hz DC to 0.6 Hz DC to 0.2 Hz	0.058 % + 0.05 pF 0.024 % + 0.05 pF 0.041 % 0.24 % 0.58 pF 0.12 % + 0.018 pF 0.39 % + 7.8 pF 0.39 % + 7.8 pF 0.21 % + 7.8 pF 0.21 % + 78 pF 0.21 % + 0.23 nF 0.21 % + 0.78 nF 0.21 % + 2.3 nF 0.21 % + 7.8 nF 0.32 % + 23 nF 0.36 % + 78 nF 0.36 % + 0.23 μ F 0.36 % + 0.78 μ F 0.36 % + 2.3 μ F 0.36 % + 7.8 μ F 0.61 % + 23 μ F 0.90 % + 78 μ F	Arco SS32 5520A
NVLAP Code: 20/E11 LF INDUCTANCE Inductance – Measure Field calibrations available <small>Note 4</small>	1 mH to 10 mH 10 mH to 10 H	60 Hz to 1 kHz	0.038 % + 0.1 μ H 0.039 % + 1.4 μ H	GenRad 1689M

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Inductance – Measure Equipment Field calibrations available <small>Note 4</small>	1 mH 10 mH 100 mH	1 kHz	0.12 % 0.12 % 0.12 %	Standard Inductor
NVLAP Code: 20/E15 PHASE METERS Phase Meters – Measure Equipment Field calibrations available <small>Note 4</small>	0° to 180°	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 20 kHz	0.11° 0.20° 0.40° 1.9° 3.9° 7.8°	Fluke 5520A
TIME and FREQUENCY				
NVLAP Code: 20/F01 FREQUENCY DISSEMINATION Frequency – Source and Measure In-Lab Field <small>Note 4</small>	10 MHz	Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise, and gating errors	5.8×10^{-10}	Rubidium Oscillator
	10 MHz		2.9×10^{-9}	HP 5328A Counter
NVLAP Code: 20/F03 OSCILLATOR CHARACTERIZATION Total Harmonic Distortion 5 Hz to 600 kHz Fundamental Input Voltage Range < 30 V Total Harmonic Distortion	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	3.5 % 6.9 % 14 % 6.9 % 3.5 % 6.9 % 14 %	Agilent 334A

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Input Voltage Range > 30 V	100 % to 0.3 % 0.1 %	10 Hz to 300 kHz 300 kHz to 500 kHz 500 kHz 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	3.5 % 6.9 % 14 % 14 % 6.9 % 3.5 % 6.9 % 14 %	Agilent 334A
Total Harmonic Distortion	0 dBc to -80 dBc	10 Hz to 2 GHz	1.8 dB	Agilent 8563E and 8903B

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NVLAP Code: 20/F04 PULSE WAVEFORM Rise Time – Generate	≥ 150 ps	39 ps	Fluke 9500B
Rise Time – Measure	≥ 800 ps	920 ps	TDS 5054 Oscilloscope
MECHANICAL			
NVLAP Code: 20/M01 ACOUSTIC Sound Measuring Equipment Harmonic Frequency Range 125 Hz to 2 kHz 4 kHz 125 Hz to 2 kHz 4 kHz	74 dB to 104 dB 114 dB	0.46 dB 0.73 dB 0.37 dB 0.62 dB	GenRad 1986
NVLAP Code: 20/M06 FORCE Force Measuring Equipment – Tension and Compression	0 lbf to 500 lbf 50 lbf to 500 lbf 500 lbf to 2000 lbf 2000 lbf to 5000 lbf	0.026 % + 0.001 lbf 0.28 lbf 0.48 lbf 1.2 lbf	Dead Weight – Class F Weights Interface Gold System

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	5000 lbf to 10 000 lbf	2.4 lbf	
	10 000 lbf to 25 000 lbf	9.2 lbf	
NVLAP Code: 20/M08			
MASS			
Metric	30 kg	0.034 g	Echelon III
	25 kg	0.023 g	
	20 kg	0.021 g	
	10 kg	5.9 mg	
	5 kg	2.6 mg	
	2 kg	1.8 mg	
	1 kg	1.1 mg	
	500 g	0.30 mg	
	200 g	0.15 mg	
	100 g	0.14 mg	
	50 g	83 µg	
	20 g	79 µg	
	10 g	58 µg	
	5 g	32 µg	
	2 g	16 µg	
	1 g	16 µg	
	500 mg	18 µg	
	200 mg	18 µg	
	100 mg	18 µg	
	50 mg	18 µg	
	20 mg	18 µg	
	10 mg	18 µg	
	5 mg	17 µg	
	2 mg	17 µg	
	1 mg	17 µg	
Avoirdupois	50 lb	2.3 g	Echelon III
	30 lb	1.4 g	
	20 lb	910 mg	
	10 lb	460 mg	
	5 lb	230 mg	
	3 lb	140 mg	
	2 lb	91 mg	

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CALIBRATION LABORATORIES

NVLAP LAB CODE 200903-0

Scope Revised: 2013-01-22

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
Balances and Scales	1 lb	46 mg	
Metric	8 oz	23 mg	
Field calibrations available <small>Note 4</small>	4 oz	12 mg	
	2 oz	5.7 mg	
	1 oz	2.9 mg	
	0.5 oz	1.4 mg	
	30 kg	29 mg	Characterized ASTM Class 1
	25 kg	15 mg	Mass Standards
	20 kg	12 mg	
	10 kg	6.3 mg	
	5 kg	3.4 mg	
	2 kg	1.5 mg	
	1 kg	0.52 mg	
	500 g	0.31 mg	
	200 g	0.10 mg	
	100 g	79 µg	
	50 g	79 µg	
	20 g	74 µg	
	10 g	50 µg	
	5 g	29 µg	
	2 g	8.3 µg	
	1 g	7.8 µg	
	500 mg	7.8 µg	
	200 mg	7.8 µg	
	100 mg	7.8 µg	
	50 mg	5.6 µg	
	20 mg	5.6 µg	
	10 mg	5.6 µg	
	5 mg	3.8 µg	
	2 mg	3.8 µg	
	1 mg	3.8 µg	
Avoirdupois	1 lb to 500 lb	0.013 %	NIST Class F Weights
Field calibrations available <small>Note 4</small>			

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
NVLAP Code: 20/M13 HARDNESS Rockwell Hardness Measuring Equipment Field calibrations available <small>Note 4</small>	High Middle Low	0.53 HRC 0.73 HRC 0.92 HRC	Hardness Blocks
	High Middle Low	1.2 HRBW 1.2 HRBW 1.3 HRBW	
Durometer Field calibrations available <small>Note 4</small>	Type A, B, O Type D, C, DO	0.31 durometer units 0.16 durometer units	Duro Calibrator, ASTM D2240
ELECTROMAGNETICS – RF/MICROWAVE			
NVLAP Code: 20/R11 RF-DC VOLTAGE/ CURRENT CONVERTER Sine Wave Flatness Field calibrations available <small>Note 4</small>	10 Hz to 1 MHz 1 MHz to 10 MHz 10 MHz to 30 MHz 30 MHz to 50 MHz 50 MHz to 80 MHz 80 MHz to 100 MHz	0.052 % 0.095 % 0.18 % 0.41 % 0.71 % 0.84 %	Ballantine 1395B

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
NVLAP Code: 20/R17 POWER METERS				
Absolute RF Power	- 30 dBm to 20 dBm	100 kHz to 4.2 GHz	1.7 %	Agilent 437 with 8482A

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
THERMODYNAMIC			
NVLAP Code: 20/T02 HUMIDITY Relative Humidity – Measuring Equipment	10 % RH to 90 % RH	0.51 % RH	Thunder Scientific 2500
Relative Humidity – Measure Field calibrations available <small>Note 4</small>	20 % RH to 80 % RH	1.3 % RH	Vaisala HMI41/HMP46
NVLAP Code: 20/T03 LABORATORY THERMOMETERS, DIGITAL and ANALOG Temperature Measuring Equipment	-80 °C to 100 °C 100 °C to 200 °C 200 °C to 300 °C 300 °C to 600 °C	0.021 °C 0.023 °C 0.070 °C 0.085 °C	Liquid Bath/Hart 5628
Measure	-195 °C to 0 °C 0 °C to 420 °C 420°C to 600 °C	0.012 °C + 0.001 % 0.026 °C + 0.001 % 0.036 °C + 0.001 %	Dry Block/Hart 5628
NVLAP Code: 20/T05 PRESSURE Absolute Pressure Source – Pneumatic	0 psia to 30 psia 30 psia to 1000 psia	0.0024 psia 0.0066 % + 0.00048 psia	Hart 5628
			DHI PPC4 w/ RPM4 Indicator

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
Gage Pressure Pneumatic	-15 psig to 30 psig 30 psi to 1000 psi -2 inH ₂ O to 2 inH ₂ O -36 inH ₂ O to -22 inH ₂ O -22 inH ₂ O to 22 inH ₂ O 22 inH ₂ O to 60 inH ₂ O 60 inH ₂ O to 72 inH ₂ O 72 inH ₂ O to 804 inH ₂ O 0.14 psig to 25 psig	0.0021 psi 0.0066 % + 0.0001 psi 0.00061 inH ₂ O 0.0090 % + 150 μinH ₂ O 0.002 inH ₂ O 0.0090 % + 150 μinH ₂ O 0.0067 inH ₂ O 0.0090 % + 150 μinH ₂ O 0.017 % + 44 μpsi	Dwyer 1430 Microtector DHI PPC 4 Controller Ametek RK-1100 WC
Gage Pressure, Hydraulic	10 psig to 16 000 psig	0.012 %	Pressurements P3125-3
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	0.54 °C 0.54 °C 0.66 °C 0.72 °C 0.92 °C 1.6 °C 2.1 °C	Fluke Black Body
NVLAP Code: 20/T08 THERMOCOUPLES Thermocouple Devices	Type E -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 Type J -210 °C to -100 °C	0.39 °C 0.12 °C 0.11 °C 0.12 °C 0.16 °C 0.21 °C	Fluke 5520A

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
Type K	-100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.12 °C 0.11 °C 0.13 °C 0.18 °C	
Type T	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.26 °C 0.14 °C 0.12 °C 0.20 °C 0.31 °C	
Type R	0 °C to 250 °C 250°C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.49 °C 0.19 °C 0.12 °C 0.11 °C	
Type S	0 °C to 250 °C 250°C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.36 °C 0.28 °C 0.29 °C 0.36 °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	0.31 °C 0.17 °C 0.15 °C 0.14 °C 0.21 °C	

END

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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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