NVLAP® National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Oak Ridge Metrology Center	**Parameter(s) of Accreditation**
P. O. Box 2009 Oak Ridge, TN 37831-8091 Mr. Nick Eastman Phone: 865-241-1427 Fax: 865-574-2802 E-mail: eastmanns@y12.doe.gov URL: http://www.y12.doe.gov/complementarywork/metrology/	Dimensional Electromagnetics – DC/Low Frequency Time and Frequency Mechanical Thermodynamic

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3]	Remarks
DIMENSIONAL			
NVLAP Code: 20/D03 **GAGE BLOCKS** Steel and Chrome Only	 0.010 in to 0.090 in > 0.090 in to 1.000 in > 1.0 in to 4.0 in 0.30 mm to 2.5 mm > 2.50 mm to 25 mm > 25 mm to 100 mm	L is length in inches. 4.1 µin 3.8 µin (3.3 + 0.46L) µin L is length in meters. 0.10 µm 0.10 µm (0.08 + 0.46L) µm	 Mechanical Comparison Mechanical Comparison
NVLAP Code: 20/D05 **LENGTH and DIAMETER; STEP GAGES** Length	 0 m to 0.8 m 0 m to 1.2 m	L is length in meters. (0.32 + 0.37L) µm (0.32 + 0.46L) µm	 Moore M32 CMM Moore M48 CMM
NVLAP Code: 20/D06 **LINE STANDARDS** Line Standards	 0 mm to 150 mm > 150 mm to 600 mm	L is length in meters. (0.32 + 0.20L) µm (0.16 + 1.6L) µm	 CMM (optical)

2012-04-01 through 2013-03-31
Effective dates

For the National Institute of Standards and Technology

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NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3]	Remarks
NVLAP Code: 20/D08 OPTICAL REFERENCE PLANES			
Glass Reticles, Stage Micrometers, Glass Magnification Scales, Orthogonality Standards, and Calibration Charts	Field-of-View	0.20 µm	CMM (optical), Measurements taken within camera field-of-view
Optical Grid Plates / Reference Planes	0 mm to 848 mm	L is length in meters. (0.54 + 0.40L) µm	CMM (optical), Maximum length and width (600 mm x 600 mm)
NVLAP Code: 20/D09 ROUNDNESS			
Diameter	152.4 mm	0.05 µm	Roundness Instrument; 6 in
Height	101.6 mm	0.05 µm	4 in
NVLAP Code: 20/D11 SPHERICAL DIAMETER; PLUG / RING GAGES		L is length in meters.	
Spherical Diameter	≤ 4 in	14 µin	Supermicrometer
Cylindrical Diameter	≤ 1 in	12 µin	
Ring Gages (outside diameter)	to 0.91 m	(0.32 + 0.46L) µm	Moore M48 CMM; 36 in
	to 0.69 m	(0.32 + 0.37L) µm	27 in
NVLAP Code: 20/D12 SURFACE TEXTURE			
Ra (Roughness Average)	41 µin to 120 µin (1.04 µm to 3.05 µm)	5.0 µin (0.13 µm)	
	13 µin to 40 µin (0.33 µm to 1.02 µm)	1.7 µin (0.044 µm)	
	12 µin (0.31 µm)	0.85 µin (0.021 µm)	

2012-04-01 through 2013-03-31
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CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3]	Remarks
NVLAP Code: 20/D15 TWO DIMENSIONAL GAGES			
Diagonal	0 m to 0.9 m	L is length in meters. $(0.45 + 0.52L)$ µm	Moore M32 CMM
	0 m to 1.3 m	$(0.45 + 0.66L)$ µm	Moore M48 CMM
NVLAP Code: 20/D16 COORDINATE MEASUREING MACHINES			
Diagonal	0 m to 1.0 m	L is length in meters. $(0.55 + 0.64L)$ µm	Spatial Moore M32 CMM
	0 m to 1.4 m	$(0.55 + 0.80L)$ µm	Spatial Moore M48 CMM
NVLAP Code: 20/D18 GEARS			
Diameter	to 14 in	0.90 µm	CMM for Involute Profile
Diameter and Infinite Lead	to 6 in	0.80 µm	CMM for Helix
Diameter and 99 in Lead	to 6 in	0.90 µm	
Diameter and 32 in Lead	to 6 in	1.1 µm	
Diameter and 16 in Lead	to 6 in	1.2 µm	
Diameter and 11 in Lead	to 6 in	1.3 µm	
Diameter (pin offset)	to 6 in	0.70 µm	Federal Formscan for Pin Master
Diameter (pin diameter)	to 6 in	0.50 µm	CMM for Pin Master
Diameter (pin roundness)	to 6 in	0.30 µm	CMM for Pin Master
Diameter	to 24 in	1.6"	CMM for Index and Runout

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 and CURRENT				
AC Current Source	0 µA to 220 µA	10 Hz to 20 Hz	0.027 % + 16 nA	Fluke 5720A
		> 20 Hz to 40 Hz	0.019 % + 10 nA	
		> 40 Hz to 1 kHz	0.016 % + 8 nA	
		> 1 kHz to 5 kHz	0.030 % + 12 nA	

2012-04-01 through 2013-03-31
Effective dates

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3, 5]	Remarks
		> 5 kHz to 10 kHz	0.11 % + 65 nA	
	> 220 µA to 2.2 mA	10 Hz to 20 Hz	0.027 % + 40 nA	
		> 20 Hz to 40 Hz	0.019 % + 35 nA	
		> 40 Hz to 1 kHz	0.016 % + 35 nA	
		> 1 kHz to 5 kHz	0.022 % + 0.11 µA	
		> 5 kHz to 10 kHz	0.11 % + 0.65 µA	
	> 2.2 mA to 22 mA	10 Hz to 20 Hz	0.027 % + 0.40 µA	
		> 20 Hz to 40 Hz	0.019 % + 0.35 µA	
		> 40 Hz to 1 kHz	0.016 % + 0.35 µA	
		> 1 kHz to 5 kHz	0.022 % + 0.55 µA	
		> 5 kHz to 10 kHz	0.11 % + 5 µA	
	> 22 mA to 220 mA	10 Hz to 20 Hz	0.026 % + 4.0 µA	
		> 20 Hz to 40 Hz	0.018 % + 3.5 µA	
		> 40 Hz to 1 kHz	0.016 % + 2.5 µA	
		> 1 kHz to 5 kHz	0.022 % + 3.5 µA	
		> 5 kHz to 10 kHz	0.11 % + 10 µA	
	> 220 mA to 2.2 A	20 Hz to 40 Hz	0.027 % + 35 µA	
		> 40 Hz to 1 kHz	0.027 % + 35 µA	
		> 1 kHz to 5 kHz	0.046 % + 80 µA	
		> 5 kHz to 10 kHz	0.70 % + 0.16 mA	
	> 220 mA to 2.2 A	40 Hz to 1 kHz	0.047 % + 0.17 mA	
		> 1 kHz to 5 kHz	0.095 % + 0.38 mA	
		> 5 kHz to 10 kHz	0.37 % + 0.75 mA	
AC Current Measure	0 µA to 200 µA	1 Hz to 10 Hz	0.032 % + 20 nA	Fluke 8508A
		> 10 Hz to 2 kHz	0.030 % + 20 nA	
		> 2 kHz to 10 kHz	0.030 % + 20 nA	
		> 10 kHz to 30 kHz	0.073 % + 20 nA	
		> 30 kHz to 100 kHz	0.41 % + 20 nA	
	> 200 µA to 2 mA	1 Hz to 10 Hz	0.032 % + 0.20 µA	
		> 10 Hz to 2 kHz	0.030 % + 0.20 µA	
		> 2 kHz to 10 kHz	0.030 % + 0.20 µA	
		> 10 kHz to 30 kHz	0.073 % + 0.20 µA	
		> 30 kHz to 100 kHz	0.41 % + 0.20 µA	
	> 2 mA to 20 mA	1 Hz to 10 Hz	0.032 % + 2.0 µA	
		> 10 Hz to 2 kHz	0.030 % + 2.0 µA	

2012-04-01 through 2013-03-31
Effective dates

For the National Institute of Standards and Technology

CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3, 5]	Remarks
		> 2 kHz to 10 kHz	0.030 % + 2.0 µA	
		> 10 kHz to 30 kHz	0.073 % + 2.0 µA	
		> 30 kHz to 100 kHz	0.41 % + 2.0 µA	
	> 20 mA to 200 mA	1 Hz to 10 Hz	0.032 % + 20 µA	
		> 10 Hz to 2 kHz	0.029 % + 20 µA	
		> 2 kHz to 10 kHz	0.029 % + 20 µA	
		> 10 kHz to 30 kHz	0.064 % + 20 µA	
	> 200 mA to 2 A	> 10 Hz to 2 kHz	0.062 % + 0.20 mA	
		> 2 kHz to 10 kHz	0.073 % + 0.20 mA	
		> 10 kHz to 30 kHz	0.030 % + 0.20 mA	
	> 2 A to 20 A	> 10 Hz to 2 kHz	0.082 % + 2.0 mA	
		> 2 kHz to 10 kHz	0.25 % + 2.0 mA	
	200 A to 20 kA	60 Hz	0.12 %	Rogowski Coil and Integrator

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 and CURRENT			
DC Resistance Fixed Points (Shunts in air)	10 µΩ (to 1000 A)	0.025 %	L&N 4375 Shunt
	20 µΩ (to 1000 A)	0.025 %	L&N 4372 Shunt
	100 µΩ (to 300 A)	0.025 %	L&N 4224-B-A300 Resistor/Shunt
	0.001 Ω (to 500 A)	0.025 %	L&N 4363 & 4364 Shunts
	0.01 Ω (to 100 A)	0.025 %	L&N 4361 & Rubicon 1166 Shunts
	0.1 Ω (to 15 A)	0.025 %	L&N 4360 & Rubicon 1163 Shunts
DC Resistance Fixed Points (in oil)	0.001 Ω	6.3 µΩ/Ω	L&N 4223
	0.01 Ω	3.0 µΩ/Ω	L&N 4222
	0.1 Ω	4.5 µΩ/Ω	L&N 4221
	1 Ω	2.5 µΩ/Ω	L&N 4020-B
	10 Ω	1.7 µΩ/Ω	L&N 4025-B

2012-04-01 through 2013-03-31
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CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3]	Remarks
	100 Ω	1.5 μΩ/Ω	L&N 4030-B
	1 kΩ	3.5 μΩ/Ω	L&N 4035-B
	10 kΩ	3.5 μΩ/Ω	L&N 4040-B
	100 kΩ	3.5 μΩ/Ω	L&N 4045-B
	1 Ω	7.0 μΩ/Ω	Fluke 742A-1
DC Resistance Fixed Points (in air)	10 Ω	3.1 μΩ/Ω	Fluke 742A-10
	100 Ω	6.8 μΩ/Ω	Fluke 742A-100
	1 kΩ	6.8 μΩ/Ω	Fluke 742A-1k
	10 kΩ	6.8 μΩ/Ω	Fluke 742A-10k
	100 kΩ	3.5 μΩ/Ω	Fluke 742A-100k
	1 MΩ	15 μΩ/Ω	Fluke 742A-1M
	10 MΩ	15 μΩ/Ω	Fluke 742A-10M
	1.9 Ω	95 μΩ/Ω	Fluke 5720A
	19 Ω	23 μΩ/Ω	
	190 Ω	10 μΩ/Ω	
	1.9 kΩ	8.5 μΩ/Ω	
	19 kΩ	8.5 μΩ/Ω	
	190 kΩ	11 μΩ/Ω	
	1.9 MΩ	21 μΩ/Ω	
	19 MΩ	47 μΩ/Ω	
	100 MΩ	100 μΩ/Ω	
DC Resistance Ranges Measure	0 Ω to 2 Ω	17 μΩ/Ω + 4 μΩ	Fluke 8508A
	> 2 Ω to 20 Ω	9.5 μΩ/Ω + 14 μΩ	
	> 20 Ω to 200 Ω	8.0 μΩ/Ω + 50 μΩ	
	> 200 Ω to 2 kΩ	8.0 μΩ/Ω + 0.5 mΩ	
	> 2 kΩ to 20 kΩ	8.0 μΩ/Ω + 5 mΩ	
	> 20k Ω to 200 kΩ	8.0 μΩ/Ω + 50 mΩ	
	> 200 kΩ to 2 MΩ	9.0 μΩ/Ω + 1 Ω	
	> 2 MΩ to 20 MΩ	17 μΩ/Ω + 10 Ω	
	> 20 MΩ to 200 MΩ	66 μΩ/Ω + 100 Ω	
	> 200 MΩ to 2 GΩ	0.018 % + 50 kΩ	
	> 2 GΩ to 20 GΩ	0.15 % + 500 kΩ	

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3, 5]	Remarks
DC Current Source	0 µA to 220 µA	40 µA/A + 6 nA	Fluke 5720A
	> 220 µA to 2.2 mA	35 µA/A + 7 nA	
	> 2.2 mA to 22 mA	36 µA/A + 40 nA	
	> 22 mA to 220 mA	46 µA/A + 0.70 µA	
	> 220 mA to 2.2 A	86 µA/A + 12 µA	
	> 2.2 A to 11 A	0.037 % + 0.48 mA	
	> 11 A to 100 A	0.030 % + 30 mA	Valhalla 2555A
DC Current Measure	0 µA to 200 µA	12 µA/A + 0.40 nA	Fluke 8508A
	> 200 µA to 2 mA	12 µA/A + 4.0 nA	
	> 2 mA to 20 mA	14 µA/A + 40 nA	
	> 20 mA to 200 mA	48 µA/A + 0.8 µA	
	> 200 mA to 2 A	0.018 % + 16 µA	
	> 2 A to 20 A	0.040 % + 0.4 mA	
	> 20 A to 1000 A	0.025 %	L&N/ Rubicon Shunts
DC Current Source/Measure (Calibration of DC Shunts)	10 µΩ to 100 mΩ	0.050 %	Comparison to DC Shunts at Source Current 0.15 A to 1000 A
NVLAP Code: 20/E06			
DC VOLTAGE			
DC Voltage Source	0 mV to 220 mV	7.5 µV/V + 0.40 µV	Fluke 5720A
	> 220 mV to 2.2 V	5.0 µV/V + 0.70 µV	
	> 2.2 V to 11 V	3.5 µV/V + 2.5 µV	
	> 2.2 V to 22 V	3.5 µV/V + 4 µV	
	> 22 V to 220 V	5.0 µV/V + 40 µV	
	> 220 V to 1100 V	6.5 µV/V + 400 µV	
DC Voltage Measure	0 V to 200 mV	5.0 µV/V + 0.10 µV	Fluke 8508A
	> 200 mV to 2 V	3.5 µV/V + 0.40 µV	
	> 2 V to 20 V	3.5 µV/V + 4.0 µV	
	> 20 V to 200 V	5.5 µV/V + 40 µV	
	> 200 V to 1000 V	5.5 µV/V + 1.0 mV	

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CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3, 5]	Remarks
NVLAP Code: 20/E09				
LF AC VOLTAGE				
LF AC Voltage Source	0 mV to 2.2 mV	10 Hz to 20 Hz	0.027 % + 4.0 µV	Fluke 5720A
		> 20 Hz to 40 Hz	0.015 % + 4.0 µV	
		> 40 Hz to 20 kHz	0.011 % + 4.0 µV	
		> 20 kHz to 50 kHz	0.045 % + 4.0 µV	
		> 50 kHz to 100 kHz	0.062 % + 5.0 µV	
		> 100 kHz to 300 kHz	0.49 % + 10 µV	
		> 300 kHz to 500 kHz	0.50 % + 20 µV	
		> 500 kHz to 1 MHz	0.55 % + 20 µV	
	> 2.2 mV to 22 mV	10 Hz to 20 Hz	0.024 % + 4.0 µV	
		> 20 Hz to 40 Hz	94 µV/V + 4.0 µV	
		> 40 Hz to 20 kHz	85 µV/V + 4.0 µV	
		> 20 kHz to 50 kHz	0.023 % + 4.0 µV	
		> 50 kHz to 100 kHz	0.059 % + 5.0 µV	
		> 100 kHz to 300 kHz	0.16 % + 10 µV	
		> 300 kHz to 500 kHz	0.42 % + 20 µV	
		> 500 kHz to 1 MHz	0.48 % + 20 µV	
	> 22 mV to 220 mV	10 Hz to 20 Hz	0.024 % + 12 µV	
		> 20 Hz to 40 Hz	96 µV/V + 7.0 µV	
		> 40 Hz to 20 kHz	82 µV/V + 7.0 µV	
		> 20 kHz to 50 kHz	0.023 % + 7.0 µV	
		> 50 kHz to 100 kHz	0.049 % + 17 µV	
		> 100 kHz to 300 kHz	0.15 % + 20 µV	
		> 300 kHz to 500 kHz	0.42 % + 25 µV	
		> 500 kHz to 1 MHz	0.48 % + 45 µV	
	> 220 mV to 2.2 V	10 Hz to 20 Hz	0.024 % + 40 µV	
		> 20 Hz to 40 Hz	92 µV/V + 15 µV	
		> 40 Hz to 20 kHz	47 µV/V + 8.0 µV	
		> 20 kHz to 50 kHz	85 µV/V + 10 µV	
		> 50 kHz to 100 kHz	0.015 % + 30 µV	
		> 100 kHz to 300 kHz	0.073 % + 80 µV	
		> 300 kHz to 500 kHz	0.41 % + 0.20 mV	

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NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3, 5]	Remarks
		> 500 kHz to 1 MHz	0.43 % + 0.30 mV	
	> 2.2 V to 22 V	10 Hz to 20 Hz	0.024 % + 0.40 mV	
		> 20 Hz to 40 Hz	92 µV/V + 0.15 mV	
		> 40 Hz to 20 kHz	47 µV/V + 50 µV	
		> 20 kHz to 50 kHz	85 µV/V + 0.10 mV	
		> 50 kHz to 100 kHz	0.014 % + 0.20 mV	
		> 100 kHz to 300 kHz	0.066 % + 0.60 mV	
		> 300 kHz to 500 kHz	0.41 % + 2.0 mV	
		> 500 kHz to 1 MHz	0.43 % + 3.2 mV	
	> 22 V to 220 V	10 Hz to 20 Hz	0.024 % + 4.0 mV	
		> 20 Hz to 40 Hz	92 µV/V + 1.5 mV	
		> 40 Hz to 20 kHz	53 µV/V + 0.60 mV	
		> 20 kHz to 50 kHz	89 µV/V + 1.0 mV	
		> 50 kHz to 100 kHz	0.018 % + 2.5 mV	
		> 100 kHz to 300 kHz	0.11 % + 16 mV	
		> 300 kHz to 500 kHz	0.59 % + 40 mV	
		> 500 kHz to 1 MHz	0.89 % + 80 mV	
	> 220 V to 250 V	15 Hz to 40 Hz	0.030 % + 16 mV	
		> 40 Hz to 1 kHz	73 µV/V + 3.5 mV	
	220 V to 750 V	40 Hz to 1 kHz	92 µV/V + 4.0 mV	Fluke 5720A/5725A
		> 1 to 20 kHz	0.017 % + 6.0 mV	
		> 20 to 30 kHz	0.060 % + 11 mV	
		> 30 to 50 kHz	0.061 % + 11 mV	
		> 50 to 100 kHz	0.23 % + 45 mV	
	> 750 V to 1100 V	40 Hz to 1 kHz	73 µV/V + 3.5 mV	
		> 1 to 20 kHz	0.017 % + 6.0 mV	
		> 20 to 30 kHz	0.060 % + 11 mV	
LF AC Voltage Measure	0 V to 200 mV	1 Hz to 10 Hz	0.016 % + 14 µV	Fluke 8508A
		> 10 Hz to 100 Hz	0.012 % + 4.0 µV	
		> 100 Hz to 2 kHz	0.011 % + 2.0 µV	

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NVLAP LAB CODE 105000-0
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) Note 3, 5	Remarks
		> 2 kHz to 10 kHz	0.014 % + 4.0 µV	
		> 10 kHz to 30 kHz	0.034 % + 8.0 µV	
		> 30 kHz to 100 kHz	0.076 % + 20 µV	
	> 0.2 V to 2 V	1 Hz to 10 Hz	0.016 % + 120 µV	
		> 10 Hz to 100 Hz	96 µV/V + 20 µV	
		> 100 Hz to 2 kHz	75 µV/V + 20 µV	
		> 2 kHz to 10 kHz	0.011 % + 20 µV	
		> 10 kHz to 30 kHz	0.022 % + 40 µV	
		> 30 kHz to 100 kHz	0.057 % + 0.20 mV	
		> 100 kHz to 300 kHz	0.30 % + 2 mV	
		> 300 kHz to 1 MHz	1.0 % + 20 mV	
	> 2 V to 20 V	1 Hz to 10 Hz	0.016 % + 1.20 mV	
		> 10 Hz to 100 Hz	96 µV/V + 0.20 mV	
		> 100 Hz to 2 kHz	75 µV/V + 0.20 mV	
		> 2 kHz to 10 kHz	0.011 % + 0.20 mV	
		> 10 kHz to 30 kHz	0.022 % + 0.40 mV	
		> 30 kHz to 100 kHz	0.057 % + 2.0 mV	
		> 100 kHz to 300 kHz	0.30 % + 20 mV	
		> 300 kHz to 1 MHz	1.0 % + 200 mV	
	> 20 V to 200 V	1 Hz to 10 Hz	0.016 % + 12 mV	
		> 10 Hz to 100 Hz	96 µV/V + 2.0 mV	
		> 100 Hz to 2 kHz	75 µV/V + 2.0 mV	
		> 2 kHz to 10 kHz	0.011 % + 2.0 mV	
		> 10 kHz to 30 kHz	0.022 % + 4.0 mV	
		> 30 kHz to 100 kHz	0.057 % + 20 mV	
		> 100 kHz to 300 kHz	0.30 % + 200 mV	
		> 300 kHz to 1 MHz	1.0 % + 2.0 V	
	> 200 V to 1000 V	1 Hz to 10 Hz	0.016 % + 140 mV	
		> 10 Hz to 100 Hz	0.012 % + 40 mV	
		> 100 Hz to 2 kHz	0.012 % + 40 mV	
		> 2 kHz to 10 kHz	0.012 % + 40 mV	
		> 10 kHz to 30 kHz	0.023 % + 80 mV	

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NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3, 5]	Remarks
		> 30 kHz to 100 kHz	0.058 % + 0.40 V	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3]	Remarks
TIME and FREQUENCY			
NVLAP Code: 20/F01 **FREQUENCY DISSEMINATION**		Realizable uncertainty depends on frequency being measured, customer requirements, and suitability of customer's equipment.	
Frequency Dissemination	1 MHz 5 MHz 10 MHz	1×10^{-12} 1×10^{-12} 1×10^{-12}	NIST FMAS + Fluke 910R
MECHANICAL			
NVLAP Code: 20/M08 **MASS**			
Mass	30 kg 25 kg 20 kg 10 kg 5 kg 3 kg 2 kg 1 kg 500 g 200 g 100 g 50 g 20 g 10 g 5 g 2 g 1 g	22 mg 21 mg 14 mg 14 mg 2.6 mg 1.9 mg 1.9 mg 1.3 mg 1.2 mg 0.55 mg 0.27 mg 0.15 mg 0.075 mg 0.05 mg 0.027 mg 0.027 mg 0.027 mg	Echelon II

2012-04-01 through 2013-03-31
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NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3, 5]	Remarks
	500 mg 200 mg 100 mg 50 mg 10 mg 5 mg 2 mg 1 mg	0.012 mg 0.012 mg 0.012 mg 0.0060 mg 0.0040 mg 0.0030 mg 0.0030 mg 0.0030 mg	
THERMODYNAMIC			
NVLAP Code: 20/T03 **LABORATORY THEMOMETERS, DIGITAL and ANALOG** Temperature Measuring Devices	 -80 °C to 0 °C 0 °C to 150 °C 50 °C to 420 °C	 0.12 °C 0.0061 °C 0.028 °C	 Comparison to Hart 1590 & SPRT; Liquid Bath Drywell
NVLAP Code: 20/T04 **LEAK ARTIFACTS** Leal Artifacts	1.0 X 10-4 atm cc/sec to 9.9 X 10-4 atm cc/sec 1.0 X 10-5 atm cc/sec to 9.9 X 10-5 atm cc/sec 1.0 X 10-6 atm cc/sec to 9.9 X 10-6 atm cc/sec 7.0 X 10-7 atm cc/sec to 9.9 X 10-7 atm cc/sec 5.0 X 10-7 atm cc/sec to 6.9 X 10-7 atm cc/sec 3.0 X 10-7 atm cc/sec to 4.9 X 10-7 atm cc/sec	3.8 % 2.7 % 3.1 % 2.8 % 3.2 % 4.2 %	Vacuum Decay Method

2012-04-01 through 2013-03-31
Effective dates

For the National Institute of Standards and Technology

CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3, 5]	Remarks
NVLAP Code: 20/T05			
PRESSURE			
Pneumatic Deadweight Piston Gauge (Absolute Mode)	1.3 psia to 2.20 psia	0.0022 %	Direct Pressure Comparison Nitrogen; 9.0 kPa to 15.17 kPa
	2.2 psia to 4.44 psia	0.0017 %	15.17 kPa to 30.61 kPa
	4.44 psia to 7.36 psia	0.0015 %	30.61 kPa to 50.75 kPa
	7.36 psia to 95.6 psia	0.0014 %	50.75 kPa to 661.62 kPa
	95.96 psia to 1002.92 psia	0.0028 %	288.9 kPa to 6905.8 kPa
Pneumatic Deadweight Piston Gauge (Gauge Mode)			Direct Pressure Comparison Nitrogen;
	1.3 psig to 5.2 psig	0.0016 %	9.0 kPa to 35.85 kPa
	5.2 psig to 95.96 psig	0.0014 %	35.85 kPa to 661.62 kPa
	95.96 psig to 1002.92 psig	0.0029 %	661.62 kPa to 6914.89 kPa
Hydraulic Deadweight Piston Gauge (Gauge Mode)			Direct Comparison Oil;
	201.99 psig to 3706.21 psig	0.0040 %	1.39 MPa to 25.55 MPa
	3706.21 psig to 19 853.9 psig	0.0046 %	25.55 MPa to 136.89 MPa
	19 853.9 psig to 39 578.82 psig	0.0047 %	136.89 MPa to 272.89 MPa
Hydraulic Deadweight Piston Gauge (Gauge Mode)			Direct Comparison Nitrogen;
	201.99 psig to 3706.21 psig	0.0041 %	1.39 MPa to 25.55 MPa
	3706.21 psig to 15 000 psig	0.0046 %	25.55 MPa to 103.42 MPa
NVLAP Code: 20/T07			
RESISTANCE THERMOMETRY			
Resistance Temperature Devices	0.01 °C to 29.7646 °C	0.0027 °C	Comparison

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For the National Institute of Standards and Technology

National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0
Scope Revised: 2012-05-31

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.

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