



CALIBRATION LABORATORIES

NVLAP LAB CODE 200406-0

Scope Revised: 2012-10-15

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

<p>Strategic Weapons Fac. Pacific Cal. Lab. Operated by Lockheed Martin 6402 Skipjack Cir. Org. 44-43, Bldg. TSB P.O. Box 6429, NBK Bangor Silverdale, WA 98315-6499 Mr. John D. Rutherford Phone: 360-396-8730 Fax: 360-396-8193 E-mail: john.rutherford@lmco.com</p>	<p>Parameter(s) of Accreditation Dimensional Electromagnetics – DC/Low Frequency Time and Frequency Mechanical Thermodynamic</p> <p>This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01)</p>
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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			
<p>NVLAP Code: 20/D03 GAGE BLOCKS Gage Blocks – Steel</p>	0.01 in to 0.09375 in	3.3 μ in	Mechanical Comparison
	0.10 in to 1.0 in	3.3 μ in	
	2.0 in	4.0 μ in	
	3.0 in	4.9 μ in	
	4.0 in	5.9 μ in	
	5.0 in	6.2 μ in	
	6.0 in	6.8 μ in	
	7.0 in	8.7 μ in	
	8.0 in	7.3 μ in	
	10.0 in	9.0 μ in	
	12.0 in	10.1 μ in	
	16.0 in	12.9 μ in	
	20.0 in	15.9 μ in	
<p>Gage Blocks - Ceramic, Chrome Carbide and Tungsten Carbide</p>	0.01 in to 0.95 in	3.7 μ in	Mechanical Comparison
	1.0 in	3.9 μ in	
	2.0 in	4.5 μ in	
	3.0 in	5.2 μ in	
	4.0 in	6.2 μ in	

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
NVLAP Code: 20/D11 SPHERICAL DIAMETER; PLUG/RING GAGES Ring Gages	> 0 in to 8.0 in	20 μin + 2.0 μin L ^{Note 8}	Comparison to Gage Blocks
Plug Gages	> 0 in to 3.0 in	40 μin	Comparison to Gage Blocks
NVLAP Code: 20/D14 THREADED PLUGS and RING GAGES Threaded Plug Gages, 60° Pitch Diameter	> 0 in to 0.5 in >0.5 in to 3.5 in	60 μin + 20 μin L ^{Note 8} 45 μin + 10 μin L ^{Note 8}	Three Wire Method Universal Measuring Machine
Major Diameter Pitch	> 0 in to 3.5 in 10 TPI to 80 TPI	40 μin 50 μin	
Threaded Ring Gages, 60° Minor Diameter	> 0 in to 6.0 in	40 μin	

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

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
ELECTROMAGNETICS – DC/LOW FREQUENCY				
NVLAP Code: 20/E02 AC RESISTORS and CURRENT AC Current - Generate	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	230 $\mu\text{A/A}$ + 16 nA 140 $\mu\text{A/A}$ + 10 nA 110 $\mu\text{A/A}$ + 8 nA 250 $\mu\text{A/A}$ + 12 nA 900 $\mu\text{A/A}$ + 65 nA	Fluke 5720A
	2.2 mA	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz	230 $\mu\text{A/A}$ + 40 nA 140 $\mu\text{A/A}$ + 35 nA 110 $\mu\text{A/A}$ + 35 nA 180 $\mu\text{A/A}$ + 110 nA	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
	22 mA	5 kHz to 10 kHz	900 μ A/A + 650 nA	
		10 Hz to 20 Hz	230 μ A/A + 400 nA	
		20 Hz to 40 Hz	140 μ A/A + 350 nA	
		40 Hz to 1 kHz	110 μ A/A + 350 nA	
		1 kHz to 5 kHz	180 μ A/A + 550 nA	
		5 kHz to 10 kHz	900 μ A/A + 5000 nA	
	220 mA	10 Hz to 20 Hz	230 μ A/A + 4 μ A	
		20 Hz to 40 Hz	140 μ A/A + 3.5 μ A	
		40 Hz to 1 kHz	110 μ A/A + 2.5 μ A	
		1 kHz to 5 kHz	180 μ A/A + 3.5 μ A	
		5 kHz to 10 kHz	900 μ A/A + 10 μ A	
		2.2 A	20 Hz to 1 kHz	
	1 kHz to 5 kHz		390 μ A/A + 80 μ A	
	5 kHz to 10 kHz		6000 μ A/A +	
			160 μ A	
	11 A	40 Hz to 1 kHz	400 μ A/A + 170 μ A	
1 kHz to 5 kHz		850 μ A/A + 380 μ A		
5 kHz to 10 kHz		3300 μ A/A +		
		750 μ A		

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

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) ^{Note 3}	Remarks
NVLAP Code: 20/E05 DC RESISTANCE and CURRENT DC Current - Generate	220 μ A	35 μ A/A + 6 nA	Fluke 5720A
	2.2 mA	30 μ A/A + 7 nA	
	22 mA	30 μ A/A + 40 nA	
	220 mA	40 μ A/A + 0.7 μ A	

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
DC Resistance - Measure	2.2 A	60 μ A/A + 12 μ A	Fluke 5720 and Fluke 5725A
	11 A	340 μ A/A + 48 μ A	
	1.0 Ω	1 $\mu\Omega/\Omega$	Guildline 6622A
	10.0 Ω	1 $\mu\Omega/\Omega$	
	100.0 Ω	1 $\mu\Omega/\Omega$	
	1000.0 Ω	1 $\mu\Omega/\Omega$	
	10 000.0 Ω	1 $\mu\Omega/\Omega$	
100 000.0 Ω	1 $\mu\Omega/\Omega$		
NVLAP Code: 20/E06 DC VOLTAGE			
DC Voltage - Generate	0.1 V	8.1 μ V/V	Comparison with 10 V Reference Cell Fluke 732A, Fluke 732B
	1.0 V	1.3 μ V/V	
	10.0 V	1.0 μ V/V	
	100.0 V	1.0 μ V/V	
	1000.0 V	1.1 μ V/V	

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

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
NVLAP Code: 20/E09 LF AC VOLTAGE				
AC Voltage – Generate	2.2 mV	10 Hz to 20 Hz	220 μ V/V + 4 μ V	Fluke 5720A
		20 Hz to 40 Hz	85 μ V/V + 4 μ V	
		40 Hz to 20 kHz	75 μ V/V + 4 μ V	
		20 kHz to 50 kHz	180 μ V/V + 4 μ V	
		50 kHz to 100 kHz	460 μ V/V + 5 μ V	
		100 kHz to 300 kHz	900 μ V/V + 10 μ V	
		300 kHz to 500 kHz	1200 μ V/V + 20 μ V	
	500 kHz to 1 MHz	2500 μ V/V + 20 μ V		
	22 mV	10 Hz to 20 Hz	220 μ V/V + 4 μ V	
		20 Hz to 40 Hz	85 μ V/V + 4 μ V	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
	220 mV	40 Hz to 20 kHz	75 $\mu\text{V/V} + 4 \mu\text{V}$	
		20 kHz to 50 kHz	180 $\mu\text{V/V} + 4 \mu\text{V}$	
		50 kHz to 100 kHz	460 $\mu\text{V/V} + 5 \mu\text{V}$	
		100 kHz to 300 kHz	900 $\mu\text{V/V} + 10 \mu\text{V}$	
		300 kHz to 500 kHz	1200 $\mu\text{V/V} + 20 \mu\text{V}$	
		500 kHz to 1 MHz	2500 $\mu\text{V/V} + 20 \mu\text{V}$	
		10 Hz to 20 Hz	220 $\mu\text{V/V} + 12 \mu\text{V}$	
		20 Hz to 40 Hz	85 $\mu\text{V/V} + 7 \mu\text{V}$	
		40 Hz to 20 kHz	75 $\mu\text{V/V} + 7 \mu\text{V}$	
		20 kHz to 50 kHz	180 $\mu\text{V/V} + 7 \mu\text{V}$	
	2.2 V	50 kHz to 100 kHz	420 $\mu\text{V/V} + 17 \mu\text{V}$	
		100 kHz to 300 kHz	750 $\mu\text{V/V} + 20 \mu\text{V}$	
		300 kHz to 500 kHz	1200 $\mu\text{V/V} + 25 \mu\text{V}$	
		500 kHz to 1 MHz	2500 $\mu\text{V/V} + 45 \mu\text{V}$	
		10 Hz to 20 Hz	220 $\mu\text{V/V} + 40 \mu\text{V}$	
		20 Hz to 40 Hz	80 $\mu\text{V/V} + 15 \mu\text{V}$	
		40 Hz to 20 kHz	40 $\mu\text{V/V} + 8 \mu\text{V}$	
		20 kHz to 50 kHz	70 $\mu\text{V/V} + 10 \mu\text{V}$	
	22 V	50 kHz to 100 kHz	105 $\mu\text{V/V} + 30 \mu\text{V}$	
		100 kHz to 300 kHz	340 $\mu\text{V/V} + 80 \mu\text{V}$	
		300 kHz to 500 kHz	900 $\mu\text{V/V} + 200 \mu\text{V}$	
		500 kHz to 1 MHz	1500 $\mu\text{V/V} + 300 \mu\text{V}$	
		10 Hz to 20 Hz	220 $\mu\text{V/V} + 400 \mu\text{V}$	
		20 Hz to 40 Hz	80 $\mu\text{V/V} + 150 \mu\text{V}$	
40 Hz to 20 kHz		40 $\mu\text{V/V} + 50 \mu\text{V}$		
20 kHz to 50 kHz		70 $\mu\text{V/V} + 100 \mu\text{V}$		
220 V	50 kHz to 100 kHz	95 $\mu\text{V/V} + 200 \mu\text{V}$		
	100 kHz to 300 kHz	260 $\mu\text{V/V} + 600 \mu\text{V}$		
	300 kHz to 500 kHz	900 $\mu\text{V/V} + 200 \mu\text{V}$		
	500 kHz to 1 MHz	1300 $\mu\text{V/V} + 3200 \mu\text{V}$		
	10 Hz to 20 Hz	220 $\mu\text{V/V} + 4 \mu\text{V}$		

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks	
	1100 V	20 Hz to 40 Hz	80 μ V/V + 1.5 μ V	Fluke 5720 and Fluke 5725A	
		40 Hz to 20 kHz	47 μ V/V + 0.6 μ V		
		20 kHz to 50 kHz	75 μ V/V + 1 μ V		
		50 kHz to 100 kHz	130 μ V/V + 2.5 μ V		
		100 kHz to 300 kHz	800 μ V/V + 16 μ V		
		300 kHz to 500 kHz	4200 μ V/V + 40 μ V		
	750 V	500 kHz to 1 MHz	7000 μ V/V + 80 μ V		Fluke 5720 and Fluke 5725A
		15 Hz to 50 Hz	260 μ V/V + 16 μ V		
		50 Hz to 1 kHz	60 μ V/V + 3.5 μ V		
		40 Hz to 1 kHz	80 μ V/V + 4 mV		
		1 kHz to 20 kHz	125 μ V/V + 6 mV		
		20 kHz to 50 kHz	360 μ V/V + 11 mV		
		3 kHz to 50 kHz	360 μ V/V + 11 mV		
		50 kHz to 100 kHz	1300 μ V/V + 45 mV		

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

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) ^{Note 3}	Remarks
NVLAP Code: 20/E10 LF CAPACITANCE			
	1 pF to 1000 pF	7 μ F/F	Andeen Hagerling 2550A
LF Capacitance	1000 pF to 0.01 μ F	20 μ F/F	
	0.01 μ F to 1 μ F	80 μ F/F	
NVLAP Code: 20/E15			
TIME AND FREQUENCY			
NVLAP Code: 20/F01 FREQUENCY DISSEMINATION Frequency - Generate			HP 5071A
	1 MHz	2 x 10 ⁻¹² Hz	
	5 MHz	2 x 10 ⁻¹² Hz	

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
	10 MHz	2×10^{-12} Hz	
NVLAP Code: 20/F02 TIME DISSEMINATION Time	1 pps	10 μ s	Datum 9390-6000
MECHANICAL			
NVLAP Code: 20/M06 FORCE Force	200 lbf to 1000 lbf 1000 lbf to 3000 lbf 3000 lbf to 5000 lbf 5000 lbf to 10 000 lbf 10 000 lbf to 30 000 lbf 30 000 lbf to 50 000 lbf 50 000 lbf to 100 000 lbf	0.5 lbf 1. lbf 2 lbf 10 lbf 14 lbf 20 lbf 35 lbf	Ultra Precision Load Cells
NVLAP Code: 20/M08 MASS Metric	20 kg 10 kg 5 kg 3 kg 2 kg 1 kg 500 g 300 g 200 g 100 g 50 g 30 g 20 g 10 g 5 g 3 g 2 g 1 g	12 mg 5.9 mg 4.2 mg 4.2 mg 4.2 mg 0.7 mg 0.7 mg 0.7 mg 0.13 mg 0.09 mg 0.09 mg 0.09 mg 0.03 mg 0.013 mg 0.012 mg 0.012 mg 0.005 mg	Echelon III; Double substitution using ASTM Class 3 weights.

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
Avoirdupois	500 mg	0.005 mg	Echelon III; Double substitution using ASTM Class 3 weights.
	300 mg	0.005 mg	
	200 mg	0.005 mg	
	100 mg	0.005 mg	
	50 mg	0.005 mg	
	30 mg	0.005 mg	
	20 mg	0.005 mg	
	10 mg	0.005 mg	
	5 mg	0.005 mg	
	3 mg	0.005 mg	
	2 mg	0.005 mg	
	1 mg	0.005 mg	
	50 lb	54 mg	
	25 lb	28 mg	
	20 lb	26 mg	
	10 lb	6.8 mg	
	5 lb	5.1 mg	
	3 lb	4.1 mg	
	2 lb	0.70 mg	
	1 lb	0.67 mg	
	8 oz	0.65 mg	
	4 oz	0.15 mg	
	2 oz	0.11 mg	
	1 oz	0.10 mg	
	1/2 oz	0.087 mg	
	1/4 oz	0.023 mg	
	1/8 oz	0.016 mg	
1/16 oz	0.013 mg		
1/32 oz	0.012 mg		

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
NVLAP Code: 20/M15 TORQUE Torque	2.0 lb-in to 20 lb-in 10 lb-in to 100 lb-in 10 lb-ft to 100 lb-ft 100 lb-ft to 1000 lb-ft	0.2 % of Full Scale (FS) 0.1 % of Full Scale (FS) or 0.2 % of Indicated Value (IV) whichever is greater 0.1 % of Full Scale (FS) or 0.2 % of Indicated Value (IV) whichever is greater 0.1 % of Full Scale (FS) or 0.2 % of Indicated Value (IV) whichever is greater	

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

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
THERMODYNAMIC			
NVLAP Code: 20/T02 HUMIDITY Relative Humidity	10 % RH to 95 % RH	1.2 % RH	Thunder Scientific 2500
NVLAP Code: 20/T03 LABORATORY THERMOMETERS, DIGITAL and ANALOG Temperature – Measuring Equipment	0 °C to 260 °C	0.0076 °C	Comparison to SPRT
NVLAP Code: 20/T05 PRESSURE Pressure – Absolute	2 psia to 100 psia	0.004 % + 0.0001 psia	Low Pressure DWT

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
Pressure – Gage	2 psig to 1000 psig	0.004 %	Low Pressure DWT High Pressure DWT
	50 psig to 2500 psig	0.004 %	
	200 psia to 10 000 psig	0.004 %	
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: L is the length in inches of device under test.

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