



**National Voluntary  
Laboratory Accreditation Program**



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005**

**Strategic Weapons Fac. Pacific Cal. Lab. Oper. by Lockheed Martin**

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**CALIBRATION LABORATORIES**

**NVLAP LAB CODE 200406-0**

*NVLAP Code:* 20/A01

ANSI/NCSL Z540-1-1994; Part 1

Compliant

**DIMENSIONAL**

*NVLAP Code:* 20/D03

Gage Blocks - Steel

<i>Range in inches</i>	<i>Best Uncertainty (<math>\pm</math>) in <math>\mu\text{in}</math> <sup>note 1</sup></i>	<i>Remarks</i>
0.01 to 0.09375	3.3	Mechanical Comparison
0.10 to 1.0	3.3	Mechanical Comparison
2.0	3.4	Mechanical Comparison
3.0	3.8	Mechanical Comparison
4.0	4.3	Mechanical Comparison
5.0	4.3	Mechanical Comparison
6.0	5.0	Mechanical Comparison
7.0	5.7	Mechanical Comparison
8.0	6.4	Mechanical Comparison
10.0	7.9	Mechanical Comparison
12.0	9.4	Mechanical Comparison
16.0	12.2	Mechanical Comparison
20.0	15.2	Mechanical Comparison

2008-04-01 through 2009-03-31

*Effective dates*

*For the National Institute of Standards and Technology*



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## CALIBRATION LABORATORIES

NVLAP LAB CODE 200406-0

Gage Blocks - Ceramic, Chrome Carbide and Tungsten Carbide

0.01 to 0.09375	4.3	Mechanical Comparison
0.10 to 1.0	4.3	Mechanical Comparison
2.0	4.4	Mechanical Comparison
3.0	4.8	Mechanical Comparison
4.0	5.3	Mechanical Comparison

**NVLAP Code:** 20/D11

Spherical Diameter, Plug Ring Gages

<b>Range in inches</b>	<b>Best Uncertainty (<math>\pm</math>) in <math>\mu\text{in}</math> <sup>note 1</sup></b>	<b>Remarks</b>
Ring Gages		
> 0 to 8.0	20	Comparison to Gage Blocks
Plug Gages		
> 0 to 3.0	40	Comparison to Gage Blocks

**NVLAP Code:** 20/D14

Threaded Plug and Ring Gages

Threaded Plug Gages, 60°

	<b>Range</b>	<b>Best Uncertainty (<math>\pm</math>) in <math>\mu\text{in}</math> <sup>note 1</sup></b>	<b>Remarks</b>
Pitch Diameter	> 0 in to 6.0 in	90	Three Wire Method
Major Diameter	> 0 in to 6.0 in	40	Universal Measuring Machine
Pitch	4 TPI to 80 TPI	100	Universal Measuring Machine

Threaded Ring Gages, 60°

Minor Diameter	> 0 in to 6.0 in	40
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## CALIBRATION LABORATORIES

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### ELECTROMAGNETICS - DC/LOW FREQUENCY

**NVLAP Code:** 20/E02  
AC Current

<b>Range</b>	<b>Best Uncertainty (<math>\pm</math>) in ppm <sup>note 1</sup></b>	<b>Frequency Range</b>
10 $\mu$ A to 220 $\mu$ A	146 to 7400	10 Hz to 10 kHz
220 $\mu$ A to 2.2 mA	126 to 3855	10 Hz to 10 kHz
2.2 mA to 22 mA	126 to 3173	10 Hz to 10 kHz
22 mA to 220 mA	121 to 1355	10 Hz to 10 kHz
220 mA to 2.2 A	256 to 6727	20 Hz to 10 kHz
2.2 A to 11 A (w/5725A)	416 to 3641	40 Hz to 10 kHz

**NVLAP Code:** 20/E05  
DC Current

<b>Range</b>	<b>Best Uncertainty (<math>\pm</math>) in ppm <sup>note 1</sup></b>	<b>Remarks</b>
10 $\mu$ A to 220 $\mu$ A	62 to 635	
220 $\mu$ A to 2.2 mA	33 to 62	
2.2 mA to 22 mA	32 to 48	
22 mA to 220 mA	53 to 72	
220 mA to 2.2 A	114 to 115	
2.2 A to 11 A (w/5725A)	384 to 558	

**NVLAP Code:** 20/E05  
DC Resistance

<b>Range in ohms</b>	<b>Best Uncertainty (<math>\pm</math>) in ppm <sup>note 1</sup></b>	<b>Remarks</b>
1.0	3	Using Guildline Bridge
10.0	3	Using Guildline Bridge
100.0	3	Using Guildline Bridge
1000.0	3	Using Guildline Bridge
10 000.0	3	Using Guildline Bridge
100 000.0	3	Using Guildline Bridge

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## CALIBRATION LABORATORIES

NVLAP LAB CODE 200406-0

**NVLAP Code:** 20/E06

DC Voltage

<b>Range (<math>\pm</math>) in V</b>	<b>Best Uncertainty (<math>\pm</math>) in ppm <sup>note 1</sup></b>	<b>Remarks</b>
0.1	8.1	Compared to 10 V Reference Cell
1.0	1.3	Compared to 10 V Reference Cell
10.0	1.0	Compared to 10 V Reference Cell
100.0	1.0	Compared to 10 V Reference Cell
1000.0	1.1	Compared to 10 V Reference Cell

**NVLAP Code:** 20/E09

LF AC Voltage

<b>Range</b>	<b>Best Uncertainty (<math>\pm</math>) in ppm <sup>note 1</sup></b>	<b>Frequency Range</b>
1 mV to 2.2 mV	1893 to 22500	10 Hz to 1 MHz
2.2 mV to 22 mV	257 to 11591	10 Hz to 1 MHz
22 mV to 220 mV	107 to 4546	10 Hz to 1 MHz
220 mV to 2.2 V	44 to 2864	10 Hz to 1 MHz
2.2 V to 22 V	42 to 2755	10 Hz to 1 MHz
22 V to 220 V	50 to 10636	10 Hz to 1 MHz
220 V to 250 V	324 to 333	15 Hz to 50 Hz
220 V to 1100 V	63 to 76	50 Hz to 1 kHz
220 V to 110 V (with 5725A)	84 to 410	40 Hz to 30 kHz
220 V to 750 V (w/5725A)	375 to 1505	30 kHz to 100 kHz

**NVLAP Code:** 20/E10

LF Capacitance

<b>Range</b>	<b>Best Uncertainty (<math>\pm</math>) <sup>note 1</sup></b>	<b>Remarks</b>
10 pF to 1 $\mu$ F	0.0125%	GR 1620-AP Bridge System

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*NVLAP Code:* 20/E15  
Phase Meters

**Range** *Best Uncertainty (±) in m<sup>o</sup> notes 1, 2*  
0.000° to 999.999°

<i>Amplitude and Ratio</i>	<i>Frequency Range in Hertz</i>			
	<i>1 to 1 k</i>	<i>&gt; 1 k to 6.25 k</i>	<i>&gt; 6.25 k to 50 k</i>	<i>&gt; 50 k to 100 k</i>
5 V, 1:1 Ratio	5	5	10	20
50 mV to 100 V, 10:1 ratio	5 + 0.05 R	10 + 0.1 R	15 + 0.15 R	40 + 0.4 R
100 V to 120 V, 100:1 ratio	10 + 0.1 R	20 + 0.2 R	30 + 0.3 R	100 + R

**TIME AND FREQUENCY**

*NVLAP Code:* 20/F01  
Frequency Dissemination

<i>Range in MHz</i>	<i>Best Uncertainty (±) note 1</i>	<i>Remarks</i>
0.1	2 x 10 <sup>-12</sup>	
1	2 x 10 <sup>-12</sup>	
5	2 x 10 <sup>-12</sup>	
10	2 x 10 <sup>-12</sup>	

*NVLAP Code:* 20/F02  
Time Dissemination

<i>Range</i>	<i>Best Uncertainty (±) note 1</i>	<i>Remarks</i>
1 pps	10 μs	

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## CALIBRATION LABORATORIES

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### MECHANICAL

NVLAP Code: 20/M06

Force

<i>Range in lbs</i>	<i>Best Uncertainty (±) in lbs <sup>note 1</sup></i>	<i>Remarks</i>
200 to 1000	0.48	Morehouse Proving Ring
1000 to 3000	1.07	Morehouse Proving Ring
3000 to 5000	1.56	Morehouse Proving Ring
5000 to 10 000	3.13	Morehouse Proving Ring
10 000 to 30 000	13.8	Morehouse Proving Ring
30 000 to 50 000	19.4	Morehouse Proving Ring
50 000 to 100 000	3.13	Morehouse Proving Ring

Force - Torque

<i>Range</i>	<i>Best Uncertainty (±) <sup>note 1</sup></i>	<i>Remarks</i>
2.0 lb-in to 20 lb-in	0.1 % of Full Scale (FS) or 0.2 % of Indicated Value (IV) whichever is greater	
10 lb-in to 100 lb-in	0.1 % of Full Scale (FS) or 0.2 % of Indicated Value (IV) whichever is greater	
10 lb-ft to 100 lb-ft	0.1 % of Full Scale (FS) or 0.2 % of Indicated Value (IV) whichever is greater	
100 lb-ft to 1000 lb-ft	0.1 % of Full Scale (FS) or 0.2 % of Indicated Value (IV) whichever is greater	

NVLAP Code: 20/M08

Mass

<i>Range</i>	<i>Best Uncertainty (±) in mg <sup>note 1</sup></i>	<i>Remarks <sup>note 3</sup></i>
20 kg	29	Echelon III
10 kg	5.9	Echelon III

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5 kg	4.2	Echelon III
3 kg	4.2	Echelon III
2 kg	4.2	Echelon III
1 kg	0.7	Echelon III
500 g	0.7	Echelon III
300 g	0.7	Echelon III
200 g	0.7	Echelon III
100 g	0.13	Echelon III
50 g	0.09	Echelon III
30 g	0.09	Echelon III
20 g	0.09	Echelon III
10 g	0.03	Echelon III
5 g	0.013	Echelon III
3 g	0.012	Echelon III
2 g	0.012	Echelon III
1 g	0.005	Echelon III
500 mg	0.005	Echelon III
300 mg	0.005	Echelon III
200 mg	0.005	Echelon III
100 mg	0.005	Echelon III
50 mg	0.005	Echelon III
30 mg	0.005	Echelon III
20 mg	0.005	Echelon III
10 mg	0.005	Echelon III
5 mg	0.005	Echelon III
3 mg	0.005	Echelon III
2 mg	0.005	Echelon III
1 mg	0.005	Echelon III
Mass - Avoirdupois		
50 lb	54	Echelon III
25 lb	28	Echelon III
20 lb	26	Echelon III
10 lb	6.8	Echelon III

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5 lb	5.07	Echelon III
3 lb	4.08	Echelon III
2 lb	0.70	Echelon III
1 lb	0.67	Echelon III
8 oz	0.65	Echelon III
4 oz	0.147	Echelon III
2 oz	0.104	Echelon III
1 oz	0.101	Echelon III
1/2 oz	0.087	Echelon III
1/4 oz	0.023	Echelon III
1/8 oz	0.016	Echelon III
1/16 oz	0.013	Echelon III
1/32 oz	0.012	Echelon III

Mass - Metric

<b>Range</b>	<b>Best Uncertainty (<math>\pm</math>) in mg <sup>note 1</sup></b>	<b>Remarks <sup>note 4</sup></b>
20 kg	35	Echelon III
10 kg	15	Echelon III
5 kg	15	Echelon III
3 kg	11	Echelon III
2 kg	11	Echelon III
1 kg	1.5	Echelon III
500 g	1.5	Echelon III
300 g	1.5	Echelon III
200 g	1.5	Echelon III
100 g	0.17	Echelon III
50 g	0.15	Echelon III
30 g	0.13	Echelon III
20 g	0.11	Echelon III
10 g	0.06	Echelon III
5 g	0.05	Echelon III
3 g	0.05	Echelon III
2 g	0.05	Echelon III
1 g	0.05	Echelon III

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500 mg	0.05	Echelon III
300 mg	0.05	Echelon III
200 mg	0.05	Echelon III
100 mg	0.05	Echelon III
50 mg	0.05	Echelon III
30 mg	0.05	Echelon III
20 mg	0.05	Echelon III
10 mg	0.05	Echelon III
5 mg	0.05	Echelon III
3 mg	0.05	Echelon III
2 mg	0.05	Echelon III
1 mg	0.05	Echelon III

Mass - Avoirdupois

50 lb	58	Echelon III
25 lb	35	Echelon III
20 lb	35	Echelon III
10 lb	15	Echelon III
5 lb	12	Echelon III
3 lb	11	Echelon III
2 lb	1.5	Echelon III
1 lb	1.5	Echelon III
8 oz	1.5	Echelon III
4 oz	0.17	Echelon III
2 oz	0.15	Echelon III
1 oz	0.13	Echelon III
1/2 oz	0.11	Echelon III
1/4 oz	0.05	Echelon III
1/8 oz	0.05	Echelon III
1/16 oz	0.05	Echelon III
1/32 oz	0.05	Echelon III

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NVLAP Code: 20/M08

Balances – In Place and Off-Site<sup>note 9</sup>

### Class I<sup>note 5</sup>

<i>Range in grams</i>	<i>Readability in mg</i>	<i>Minimum Tested Capacity<sup>note 6</sup></i>	<i>Best Uncertainty (±) in milligrams<sup>notes 1,8</sup></i>	<i>Remarks<sup>note 7</sup></i>
0 to 20	0.001	100 %	0.24	NIST Class 3
0 to 30	0.01	100 %	0.35	NIST Class 3
0 to 40	0.01	100 %	0.38	NIST Class 3
0 to 60	0.1	100 %	0.6	NIST Class 3
0 to 60	1	100 %	4	NIST Class 3
0 to 150	0.01	100 %	1.5	NIST Class 3
0 to 160	0.1	100 %	1.3	NIST Class 3
0 to 200	0.1	100 %	2.1	NIST Class 3
0 to 200	1	100 %	4	NIST Class 3
0 to 500	1	100 %	5	NIST Class 3
0 to 800	1	100 %	8	NIST Class 3
0 to 1200	0.1	100 %	8.4	NIST Class 3
0 to 1200	1	100 %	10	NIST Class 3
0 to 1600	10	100 %	30	NIST Class 3
0 to 2000	10	100 %	40	NIST Class 3
0 to 40 000	2	100 %	280	NIST Class 3

### Class II<sup>note 5</sup>

0 to 100	1	100 %	9	NIST Class 3
0 to 200	10	100 %	30	NIST Class 3
0 to 300	10	100 %	10	NIST Class 3
0 to 500	10	100 %	20	NIST Class 3
0 to 600	10	100 %	50	NIST Class 3
0 to 2000	100	100 %	200	NIST Class 3
0 to 4000	100	100 %	100	NIST Class 3

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## CALIBRATION LABORATORIES

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### MICROWAVE

**NVLAP Code:** 20/R02  
RF/Microwave Termination

Reflection Coefficient (or Scattering Parameters  $S_{ii}$ )

Connector Type	Quantity	Quantity Range	0.045 G to 2 G	Best Uncertainty ( $\pm$ ) <sup>note 1</sup> Frequency in Hz		
				2 G to 8 G	8 G to 18 G	20 to 26.5 G
APC-3.5	$S_{ii}$	0 to 1	0.005 to 0.014	0.007 to 0.025	0.007 to 0.03	0.007 to 0.03
APC-3.5	Arg ( $S_{ii}$ )	$0 <  S_{ii}  < 1$ -180° to +180°	0.7 to 180	2.634 to 180	5.03 to 180	6.3 to 180
Connector Type	Quantity	Quantity Range	0.045 G to 2 G	2 G to 8 G	8 G to 18 G	20 to 26.5 G
N - Type	$S_{ii}$	0 to 1	0.004 to 0.01	0.008 to 0.019	0.008 to 0.027	
N - Type	Arg ( $S_{ij}$ )	$0 <  S_{ii}  < 1$ -180° to +180°	0.5 to 180	2.5 to 180	4.7 to 180	

**NVLAP Code:** 20/R12  
RF Power Sensor Calibration Factor

Range	Best Uncertainty ( $\pm$ ) in % <sup>note 1</sup>
10 MHz to 18 GHz @ 1 mW	3.25

**NVLAP Code:** 20/R13  
RF/Microwave Attenuators

Attenuation (or Scattering Parameters  $S_{ii}$ )

Connector Type	Quantity	Quantity Range in dB	0.045 to 2 G	Best Uncertainty ( $\pm$ ) in dB <sup>note 1</sup> Frequency in Hz		
				2 G to 8 G	8 G to 18 G	20 G to 26.5 G
APC-3.5	$S_{ij}$	0 to 20	0.05	0.05	0.07	0.08
		20 to 40	0.05	0.05 to 0.06	0.07 to 0.08	0.08 to 0.19

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		40 to 60	0.05 to 0.22	0.06 to 0.31	0.08 to 0.48	0.19 to 1.88
<b>Connector Type</b>	<b>Quantity</b>	<b>Quantity Range in dB</b>	<b>0.045 to 2 G</b>	<b>2 G to 8 G</b>	<b>8 G to 18 G</b>	
N - Type	S <sub>ij</sub>	0 to 20	0.05 to 0.06	0.06	0.09	---
		20 to 40	0.06 to 0.35	0.06	0.09 to 0.10	---
		40 to 60	---	0.06 to 0.19	0.10 to 0.31	---

**THERMODYNAMICS**

**NVLAP Code:** 20/T02  
Humidity

<b>Range</b>	<b>Best Uncertainty (±) <sup>note 1</sup></b>	<b>Remarks</b>
10 to 95 % rH	1.2% rH	Thunder Scientific 2500
35 to 95 % rH	0.29 °C-dew	General Eastern Optical Hygrometer, 1211 H-SR Sensor <sup>note 10</sup>

**NVLAP Code:** 20/T03  
Laboratory Thermometers

<b>Range</b>	<b>Best Uncertainty (±) <sup>note 1</sup></b>	<b>Remarks</b>
(0 to 260) °C	0.0076 °C	Comparison to SPRT
(-100 to 200) °F	0.23 °F	Comparison to SPRT <sup>note 10</sup>
(73.33 to 93.33) °C	0.127 °C	Comparison to SPRT <sup>note 10</sup>

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## CALIBRATION LABORATORIES

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*NVLAP Code:* 20/T05

Pressure - Absolute

<i>Range</i>	<i>Best Uncertainty (<math>\pm</math>) of reading <sup>note 1</sup></i>	<i>Remarks</i>
0.25 to 25 psia	$1.8 \times 10^{-5} + 0.000548$ psi	Low Pressure Piston
25 to 100 psia	$1.8 \times 10^{-5} + 0.001616$ psi	Middle Pressure Piston
100 to 1000 psia	$1.8 \times 10^{-5} + 0.04$ psi	High Pressure Piston
Pressure - Gage		
2 to 100	$1.8 \times 10^{-5} + 0.0016$ psi	2465 Mid Pressure Piston
0 to 1000	$1.8 \times 10^{-5} + 0.04$ psi	2465 High Pressure Piston
200 to 10000	$5.0 \times 10^{-5} + 0.14$ psi	2465 Low Pressure Piston

1. Represents an expanded uncertainty using a coverage factor,  $k = 2$ , at an approximate level of confidence of 95 %.
2. R is the ratio of the larger output voltage to the smaller output voltage.
3. Double substitution using ASTM Class 3 weights.
4. Differential weighing using ASTM Class 3 weights.
5. Scale classifications determined by NIST Handbook 44, Table 3.
6. Minimum tested capacity required by NIST Handbook 44, Table 4.
7. Class weights used.
8. Uncertainty s reported at the upper limit of the balance. Actual uncertainty may be smaller than the uncertainty reported.
9. For calibration of balances in locations other than the SWFPAC laboratory, components of uncertainty based on instrument use and environmental conditions at the operating location are needed.
10. Temperature and humidity chambers in locations other than the SWFPAC Laboratory.

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