

CALIBRATION LABORATORIES

NVLAP LAB CODE 600328-0

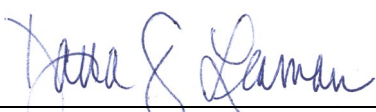
**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017**

<p><b>North Carolina Metrology Laboratory</b>  <b>Physical Address:</b> 4400 Reedy Creek Road, Room A126  <b>Mailing Address:</b> 1051 Mail Service Center                  Raleigh, NC 27699-1051                  Mr. Robert Rogers                  Phone: 984-236-4811                  E-mail: <a href="mailto:robert.rogers@ncagr.gov">robert.rogers@ncagr.gov</a>                  URL:  <a href="https://www.ncagr.gov/divisions/standards/standards-metrology-laboratory">https://www.ncagr.gov/divisions/standards/standards-metrology-laboratory</a></p>	<p><b>Fields(s) of Calibration</b>                  Dimensional                  Mechanical                  Thermodynamic</p> <p>This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (20/A01)</p>
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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>**

Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Notes 3,5</sup>	Remarks
<b>DIMENSIONAL</b>			
<b>LENGTH and DIAMETER, STEP GAGES (20/D05)</b>			
Lottery Ball diameter	37 mm to 39 mm	0.24 $\mu$ m	Pass-Through Gauge, SOP 46
<b>MECHANICAL</b>			
<b>MASS DETERMINATION (20/M08)</b>			
Metric	30 kg 25 kg 20 kg 10 kg 5 kg 3 kg 2 kg 1 kg 500 g 300 g 200 g 100 g 50 g 30 g	9.0 mg 8.6 mg 6.3 mg 2.2 mg 0.62 mg 0.38 mg 0.28 mg 0.11 mg 54 $\mu$ g 40 $\mu$ g 34 $\mu$ g 36 $\mu$ g 18 $\mu$ g 12 $\mu$ g	Echelon I, SOP 28

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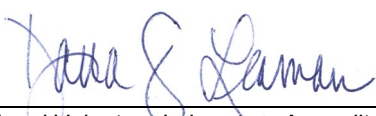
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>

Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Notes 3,5</sup>	Remarks
Avoirdupois	20 g	9.3 $\mu$ g	Echelon I, SOP 28
	10 g	8.4 $\mu$ g	
	5 g	4.2 $\mu$ g	
	3 g	2.6 $\mu$ g	
	2 g	1.8 $\mu$ g	
	1 g	1.2 $\mu$ g	
	500 mg	0.64 $\mu$ g	
	300 mg	0.43 $\mu$ g	
	200 mg	0.35 $\mu$ g	
	100 mg	0.33 $\mu$ g	
	50 mg	0.27 $\mu$ g	
	30 mg	0.23 $\mu$ g	
	20 mg	0.21 $\mu$ g	
	10 mg	0.25 $\mu$ g	
	5 mg	0.16 $\mu$ g	
	3 mg	0.14 $\mu$ g	
	2 mg	0.12 $\mu$ g	
	1 mg	0.14 $\mu$ g	
	50 lb	15 mg	
	30 lb	9.2 mg	
	25 lb	8.7 mg	
	20 lb	6.7 mg	
	10 lb	4.4 mg	
	5 lb	0.44 mg	
	4 lb	0.36 mg	
	3 lb	0.35 mg	
	2 lb	98 $\mu$ g	
	1 lb	70 $\mu$ g	
	0.5 lb	38 $\mu$ g	
	0.3 lb	25 $\mu$ g	
	0.2 lb	20 $\mu$ g	
	0.1 lb	19 $\mu$ g	
	0.05 lb	9.9 $\mu$ g	
0.03 lb	6.5 $\mu$ g		
0.02 lb	5.1 $\mu$ g		

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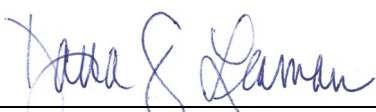
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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>**

Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Notes 3,5</sup>	Remarks
Metric	0.01 lb	4.6 $\mu$ g	Echelon II, SOP 4
	0.005 lb	2.3 $\mu$ g	
	0.003 lb	1.5 $\mu$ g	
	0.002 lb	1.1 $\mu$ g	
	0.001 lb	1.1 $\mu$ g	
	250 kg	3.3 g	
	200 kg	2.9 g	
	100 kg	1.4 g	
	30 kg	17 mg	
	25 kg	14 mg	
	20 kg	14 mg	
	10 kg	2.9 mg	
	5 kg	1.0 mg	
	3 kg	0.91 mg	
	2 kg	0.60 mg	
	1 kg	0.10 mg	
	500 g	74 $\mu$ g	
	300 g	66 $\mu$ g	
	200 g	29 $\mu$ g	
	100 g	28 $\mu$ g	
	50 g	24 $\mu$ g	
	30 g	23 $\mu$ g	
	20 g	6.8 $\mu$ g	
	10 g	6.3 $\mu$ g	
	5 g	4.1 $\mu$ g	
	3 g	3.9 $\mu$ g	
	2 g	3.8 $\mu$ g	
	1 g	3.8 $\mu$ g	
	500 mg	3.8 $\mu$ g	
	300 mg	1.1 $\mu$ g	
200 mg	0.86 $\mu$ g		
100 mg	0.86 $\mu$ g		
50 mg	0.71 $\mu$ g		
30 mg	0.79 $\mu$ g		
20 mg	0.69 $\mu$ g		

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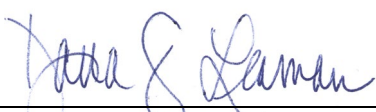
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>

Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Notes 3,5</sup>	Remarks
Avoirdupois	10 mg	0.72 $\mu$ g	Echelon II, SOP 4
	5 mg	0.67 $\mu$ g	
	3 mg	0.72 $\mu$ g	
	2 mg	0.67 $\mu$ g	
	1 mg	0.67 $\mu$ g	
	2500 lb	21 g	
	1000 lb	1.2 g	
	500 lb	0.79 g	
	100 lb	30 mg	
	50 lb	22 mg	
	30 lb	13 mg	
	25 lb	10 mg	
	20 lb	8.0 mg	
	10 lb	5.2 mg	
	5 lb	0.95 mg	
	4 lb	0.64 mg	
	3 lb	0.64 mg	
	2 lb	97 $\mu$ g	
	1 lb	93 $\mu$ g	
	0.5 lb	70 $\mu$ g	
	0.3 lb	31 $\mu$ g	
	0.2 lb	28 $\mu$ g	
	0.1 lb	27 $\mu$ g	
	0.05 lb	24 $\mu$ g	
	0.03 lb	7.6 $\mu$ g	
	0.02 lb	6.8 $\mu$ g	
	0.01 lb	5.3 $\mu$ g	
	0.005 lb	4.2 $\mu$ g	
	0.003 lb	4.0 $\mu$ g	
	0.002 lb	3.9 $\mu$ g	
	0.001 lb	3.9 $\mu$ g	
	8 oz	0.070 mg	
	4 oz	97 $\mu$ g	
2 oz	66 $\mu$ g		

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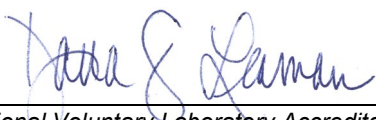
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>

Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Notes 3,5</sup>	Remarks
Metric	1 oz	44 µg	Echelon III, SOP 8
	1/2 oz	28 µg	
	1/4 oz	16 µg	
	1/8 oz	13 µg	
	1/16 oz	14 µg	
	1/32 oz	12 µg	
	1000 kg	28 g	
	500 kg	5.5 g	
	250 kg	3.6 g	
	200 kg	3.1 g	
	100 kg	1.6 g	
	50 kg	0.31 g	
	30 kg	0.13 g	
	25 kg	0.13 g	
	20 kg	0.13 g	
	10 kg	64 mg	
	5 kg	30 mg	
	3 kg	13 mg	
	2 kg	12 mg	
	1 kg	6.2 mg	
	500 g	3.4 mg	
	300 g	2.9 mg	
	200 g	1.2 mg	
	100 g	0.60 mg	
	50 g	0.37 mg	
	30 g	0.31 mg	
	20 g	0.30 mg	
	10 g	0.24 mg	
	5 g	0.16 mg	
	3 g	0.11 mg	
	2 g	90 µg	
	1 g	60 µg	
	500 mg	46 µg	
300 mg	36 µg		
200 mg	31 µg		

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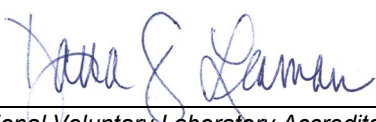
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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>**

Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Notes 3,5</sup>	Remarks
	100 mg	24 µg	
	50 mg	20 µg	
	30 mg	17 µg	
	20 mg	14 µg	
	10 mg	12 µg	
	5 mg	10 µg	
	3 mg	8.5 µg	
	2 mg	7.3 µg	
	1 mg	6.1 µg	
	Lottery Balls	2.65 g	
Avoirdupois	2500 lb	34 g	Echelon III, SOP 8
	2000 lb	27 g	
	1000 lb	3.6 g	
	500 lb	1.8 g	
	100 lb	0.29 g	
	50 lb	0.14 g	
	30 lb	97 mg	
	25 lb	86 mg	
	20 lb	59 mg	
	10 lb	28 mg	
	5 lb	13 mg	
	4 lb	11 mg	
	3 lb	8.3 mg	
	2 lb	5.6 mg	
	1 lb	3.6 mg	
	0.5 lb	2.5 mg	
	0.3 lb	1.2 mg	
	0.2 lb	0.96 mg	
	0.1 lb	0.61 mg	
	0.05 lb	0.37 mg	
0.03 lb	0.24 mg		
0.02 lb	0.22 mg		
0.01 lb	0.15 mg		
0.005 lb	0.11 mg		

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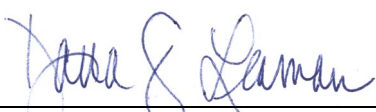
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>

Measured Parameter or Device Calibrated	Range	Uncertainty ( $k=2$ ) <sup>Notes 3,5</sup>	Remarks	
Weight Carts	0.003 lb	77 $\mu$ g	Echelon III, SOP 33	
	0.002 lb	60 $\mu$ g		
	0.001 lb	43 $\mu$ g		
	4 oz	1.1 mg		
	2 oz	0.65 mg		
	1 oz	0.39 mg		
	1/2 oz	0.28 mg		
	1/4 oz	0.17 mg		
	1/8 oz	0.11 mg		
	1/16 oz	88 $\mu$ g		
	1/32 oz	61 $\mu$ g		
	6000 lb	120 g		
	5500 lb	110 g		
	5000 lb	100 g		
	4500 lb	93 g		
4000 lb	89 g			
3000 lb	64 g			
<b>VOLUME and DENSITY (20/M12)</b>				
Volume	2000 gal	110 in <sup>3</sup>	Volume Transfer	
	1500 gal	81 in <sup>3</sup>		
	1200 gal	62 in <sup>3</sup>		
	1000 gal	53 in <sup>3</sup>		
	500 gal	29 in <sup>3</sup>		
	300 gal	7.5 in <sup>3</sup>		
	200 gal	9.4 in <sup>3</sup>		
	100 gal	4.5 in <sup>3</sup>		
	60 gal	1.1 in <sup>3</sup>		
	50 gal	1.4 in <sup>3</sup>		
	25 gal	0.82 in <sup>3</sup>		
	15 gal	0.33 in <sup>3</sup>		
	10 gal	0.29 in <sup>3</sup>		
	5 gal	0.29 in <sup>3</sup>		4 in neck
	5 gal	0.40 in <sup>3</sup>		3 in neck
1 gal	0.040 in <sup>3</sup>	2 in neck		
500 L	5.7 in <sup>3</sup>			

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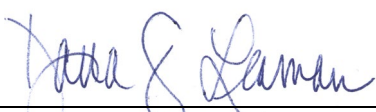
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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) <sup>Notes 1,2</sup>**

<b>Measured Parameter or Device Calibrated</b>	<b>Range</b>	<b>Uncertainty (<math>k=2</math>) <sup>Notes 3,5</sup></b>	<b>Remarks</b>
	110 gal	8.4 in <sup>3</sup>	LPG Volume Transfer
	104 gal	4.3 in <sup>3</sup>	
	103 gal	5.3 in <sup>3</sup>	
	100 gal	3.5 in <sup>3</sup>	
	50 gal	3.4 in <sup>3</sup>	
	25 gal	2.1 in <sup>3</sup>	
	24 gal	3.1 in <sup>3</sup>	
	23 gal	4.3 in <sup>3</sup>	
	20 gal	3.0 in <sup>3</sup>	
	Test Measure	5 gal	
5 gal		0.13 in <sup>3</sup>	3 in neck
5 gal		0.092 in <sup>3</sup>	2 in neck
1 gal		0.040 in <sup>3</sup>	2 in neck
Prover	100 gal	0.73 in <sup>3</sup>	
	50 gal	0.36 in <sup>3</sup>	
	25 gal	0.27 in <sup>3</sup>	
Flask	1 qt	0.16 mL	
	1 gill	0.050 mL	
	50 mL	0.15 mL	
Slicker Standard	5 gal	0.037 in <sup>3</sup>	
	1 gal	0.019 in <sup>3</sup>	
Small Volume Prover	30 gal	1.5 in <sup>3</sup>	Gravimetric Method
	20 gal	0.77 in <sup>3</sup>	
	15 gal	0.61 in <sup>3</sup>	
	5 gal	0.27 in <sup>3</sup>	

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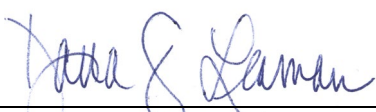
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Measured Parameter or Device Calibrated	Range	Uncertainty ( <i>k</i> =2) <sup>Notes 3,5</sup>	Remarks
<b>THERMODYNAMIC</b>			
<b>LABORATORY THERMOMETERS, DIGITAL AND ANALOG (20/T03)</b>			
Liquid in Glass and Digital	-30 °C to 95 °C	0.018 °C	Comparison to reference PRT, SOP 25
	95 °C to 230 °C	0.010 °C	
	230 °C to 660 °C	0.11 °C	
	-22 °F to 203 °F	0.032 °F	
	203 °F to 446 °F	0.018 °F	
	446 °F to 1220 °F	0.20 °F	
<b>RESISTANCE THERMOMETRY (20/T07)</b>			
Various resistance thermometry devices	-30 °C to 95 °C	0.014 °C	Comparison to reference PRT, SOP 70
	95 °C to 230 °C	0.020 °C	
	230 °C to 660 °C	0.084 °C	
	-22 °F to 203 °F	0.025 °F	
	203 °F to 446 °F	0.036 °F	
	446 °F to 1220 °F	0.15 °F	

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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.

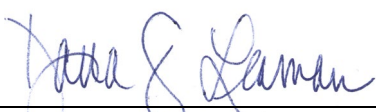
**Note 4:** Uncertainties associated with field service calibration may be greater as they incorporate on-site environmental contributions, transportation effects, or other factors that affect the measurements. (This note applies only if marked in the body of the scope.)

**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.

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