



**National Voluntary
Laboratory Accreditation Program**



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

ORNL Metrology Laboratory
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CALIBRATION LABORATORIES

NVLAP LAB CODE 200659-0
Scope Revised: 2009-09-28

NVLAP Code: 20/A01 ANSI/NCSL Z540-1-1994; Part 1 Compliant

NVLAP Code: 20/D03
Gage Blocks

<i>Range in Inches</i>	<i>Best Uncertainty (±) in μ inches ^{note 1}</i>	<i>Remarks</i>
0 to 4	4.1 + 1.1L	L in inches for Steel
0 to 4	4.2 + 0.6L	L in inches for Chrome Carbide

NVLAP Code: 20/D04
Laser Wavelength

<i>Range in nm</i>	<i>Best Uncertainty (±) ^{note 1}</i>	<i>Remarks</i>
632.991011 to 632.991595	0.09 parts in 10 ⁹	Comparison to Frazier™ Model 100

NVLAP Code: 20/D07
Measuring Wires

<i>Range in inches (TPI)</i>	<i>Best Uncertainty (±) ^{note 1}</i>	<i>Remarks</i>
0.007217 (80) to 0.144338 (4)	13 μ inches	ULM 300 and Master Wires

2009-10-01 through 2010-09-30

Effective dates

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For the National Institute of Standards and Technology



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NVLAP Code: 20/D11

Plain Ring Gages

<i>Range</i>	<i>Best Uncertainty (±) ^{note 1}</i>	<i>Remarks</i>
0.05 to 4.0 inches	12 μ inches	ULM 300 and Master Rings

Plain Plug Gages

<i>Range</i>	<i>Best Uncertainty (±) ^{note 1}</i>	<i>Remarks</i>
0.05 to 4.0 inches	15 μ inches	ULM 300 and Gage Blocks

NVLAP Code: 20/D14

Thread Plugs up to 4 Inches, 4 to 80 TPI

<i>Parameter</i>	<i>Best Uncertainty (±) ^{note 1}</i>	<i>Remarks</i>
Major Diameter	15 μ inches	ULM 300 and Gage Blocks
Pitch Diameter	55 μ inches	ULM 300 and Thread Wires
Thread Pitch	390 μ inches	Optical Comparator
Flank Angles	5 arc minutes	Optical Comparator and Angle Blocks

ELECTROMAGNETICS - DC/LOW FREQUENCY

NVLAP Code: 20/E02

AC Current Output

<i>Range in A</i>	<i>Best Uncertainty (±) in A ^{note 1}</i>						<i>Remarks</i>
	<i>Frequency in Hertz</i>						
	<i>10</i>	<i>20</i>	<i>40</i>	<i>1 k</i>	<i>5 k</i>	<i>10 k</i>	
0.00022	1.16 E-06	1.16 E-06	5.78 E-07	3.05 E-07	4.19 E-07	4.19 E-07	Source / Measure
0.0022	1.16 E-05	1.16 E-05	5.78 E-06	3.03 E-06	4.19 E-06	4.19 E-06	Source / Measure
0.022	1.16 E-04	1.16 E-04	5.78 E-05	3.02 E-05	4.13 E-05	4.13 E-05	Source / Measure
0.22	1.16 E-03	1.16 E-03	6.01 E-04	4.63 E-04	9.37 E-04	9.37 E-04	Source / Measure

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2.2	1.16 E-03	1.39 E-03	1.39 E-03	9.43 E-03	9.43 E-03	Source / Measure
11.0		2.91 E-02	2.95 E-02	3.59 E-02	3.67 E-02	Source / Measure

NVLAP Code: 20/E05

2 Wire Resistance

Range in Ω	Best Uncertainty (\pm) in Ω ^{note 1}	Remarks
0	2.89 E-01	Source / Measure
1	2.89 E-01	Source / Measure
1.9	2.89 E-01	Source / Measure
10	2.89 E-01	Source / Measure
19	2.90 E-01	Source / Measure
100	2.91 E-01	Source / Measure
190	2.92 E-01	Source / Measure
1 k	3.01 E-01	Source / Measure
1.9 k	3.19 E-01	Source / Measure
10 k	4.18 E-01	Source / Measure
19 k	5.89 E-01	Source / Measure
100 k	1.63 E + 00	Source / Measure
190 k	6.04 E + 00	Source / Measure
1 M	2.31 E + 01	Source / Measure
1.9 M	2.27 E + 02	Source / Measure
10 M	7.31 E + 02	Source / Measure
19 M	1.21 E + 04	Source / Measure
100 M	5.92 E + 04	Source / Measure

4 Wire Resistance

0	6.56 E-05	Source / Measure
1	9.59 E-05	Source / Measure
1.9	1.40 E-04	Source / Measure
10	2.69 E-04	Source / Measure
19	9.39 E-04	Source / Measure

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100	2.11 E-03	Source / Measure
190	3.11 E-03	Source / Measure
1 k	1.31 E-02	Source / Measure
1.9 k	3.10 E-02	Source / Measure
10 k	1.31 E-01	Source / Measure
19 k	2.96 E-01	Source / Measure
100 k	1.37 E + 00	Source / Measure
190 k	5.76 E + 00	Source / Measure
1 M	2.28 E + 01	Source / Measure
1.9 M	2.27 E + 02	Source / Measure
10 M	7.31 E + 02	Source / Measure
19 M	1.21 E + 04	Source / Measure

NVLAP Code: 20/E06

DC Voltage

Range in V	Best Uncertainty (\pm) in V^{note 1}	Remarks
0	9.33 E-07	Source / Measure
0.22	3.27 E-06	Source / Measure
2.2	2.20 E-05	Source / Measure
11	1.52 E-04	Source / Measure
22	2.92 E-04	Source / Measure
220	2.73 E-03	Source / Measure
1100	1.26 E-02	Source / Measure

NVLAP Code: 20/E06

DC Voltage Fixed Points

Range in V	Best Uncertainty (\pm) in V^{note 1}	Remarks
0.1	1.22 E-06	Source / Measure
1	3.65 E-06	Source / Measure
10	2.46 E-05	Source / Measure

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100	3.33 E-04	Source / Measure
1000	4.16 E-03	Source / Measure

NVLAP Code: 20/E06
DC Current

<i>Range in A</i>	<i>Best Uncertainty (±) in A^{note 1}</i>	<i>Remarks</i>
0	3.47 E-09	Source / Measure
0.00022	1.38 E-08	Source / Measure
0.0022	1.14 E-07	Source / Measure
0.022	1.45 E-06	Source / Measure
0.22	3.75 E-05	Source / Measure
2.2	2.74 E-03	Source / Measure
11.0	4.89 E-03	Source / Measure

NVLAP Code: 20/E09
LF AC Voltage

<i>Range</i>	<i>Best Uncertainty (±) in % + μV^{note 1}</i>							
	<i>Frequency in Hertz</i>							
	<i>10 to 20</i>	<i>20 to 40</i>	<i>40 to 20 k</i>	<i>20 k to 50 k</i>	<i>50 k to 100 k</i>	<i>100 k to 300 k</i>	<i>300 k to 500 k</i>	<i>500 k to 1 M</i>
2.2 mV	0.209 + 4	0.209 + 4	0.18 + 4	0.808 + 4	1.697 + 5	1.680 + 10	1.680 + 10	1.683 + 20
22 mV	0.036 + 4	0.036 + 4	0.047 + 4	0.047 + 4	0.105 + 4	0.406 + 5	1.214 + 10	1.215 + 20
220 mV	0.034 + 12	0.032 + 7	0.032 + 7	0.047 + 7	0.105 + 07	0.405 +17	1.214 + 20	1.215 + 25
2.2 V	0.034 + 40	0.032 + 15	0.032 + 15	0.046 + 8	0.104 + 10	0.404 + 30	1.213 + 80	1.214 + 200
22 V	0.048 + 400	0.047 + 150	0.047 + 150	0.052 + 50	0.150 + 100	0.150 + 200	1.790 + 600	1.791 + 2000

<i>Range</i>	<i>Best Uncertainty (±) in % + mV^{note 1}</i>							
220 V	0.071 + 4	0.070 + 1.5	0.070 + 1.5	0.150 + 0.6	0.358 + 1	0.358 + 2.5	1.749 + 16	1.777 + 40
1100 V	0.067 + 16	0.053 + 4	0.053 + 3.5					

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TIME AND FREQUENCY

NVLAP Code: 20/F01
Frequency Dissemination

<i>Range in Hz</i>	<i>Best Uncertainty (±) (Fractional Frequency Error) ^{note 1}</i>	<i>Remarks</i>
10 M	1.07×10^{-11}	GPS Master Oscillator

MECHANICAL

NVLAP Code: 20/M05
Flow Rate

<i>Range</i>	<i>Best Uncertainty (±) ^{note 1}</i>	<i>Remarks</i>
0.1 SLPM to 1.0 SLPM	0.6 % of Reading + 0.01 % FS	Laminar
3.0 SLPM to 30 SLPM	0.6 % of Reading + 0.01 % FS	Laminar
28 SLPM to 100 SLPM	0.5 % of Reading + 0.01 % FS	Sonic
67 SLPM to 250 SLPM	0.5 % of Reading + 0.01 % FS	Sonic
248 SLPM to 1000 SLPM	0.5 % of Reading + 0.01 % FS	Sonic
3 sccm to 40 000 sccm	0.56 % of Reading	Sierra

NVLAP Code: 20/M06
Torque Transducers

<i>Range</i>	<i>Best Uncertainty (±) in % ^{note 1}</i>	<i>Remarks</i>
4 to 50 in lb	0.24	
30 to 400 in lb	0.20	
80 to 1000 in lb	0.22	
20 to 250 ft lb	0.16	
60 to 600 ft lb	0.09	

Torque Wrenches

4 in lb to 600 ft lb	0.25	
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NVLAP Code: 20/M08
Mass

Range	Best Uncertainty (\pm) ^{note 1}	Remarks
50 lb	13 mg	Echelon II
20 kg	7.8 mg	Echelon II
10	2.7 mg	Echelon II
5	2.3 mg	Echelon II
2	0.41 mg	Echelon II
1	0.12 mg	Echelon II
500 g	0.067 mg	Echelon II
200	0.042 mg	Echelon II
100	0.039 mg	Echelon II
50	0.024 mg	Echelon II
20	0.011 mg	Echelon II
10	8.3 μ g	Echelon II
5	4.5 μ g	Echelon II
2	2.1 μ g	Echelon II
1	1.8 μ g	Echelon II
500 mg	1.3 μ g	Echelon II
200	1.0 μ g	Echelon II
100	1.0 μ g	Echelon II
50	0.9 μ g	Echelon II
20	0.7 μ g	Echelon II
10	0.7 μ g	Echelon II
5	0.7 μ g	Echelon II
2	0.6 μ g	Echelon II
1	0.6 μ g	Echelon II

Balances ^{Note 2}

Readability in mg	Uncertainty(\pm) in mg	Remarks
0.001	0.0043	OIML Class E2 Weights
0.01	0.059	OIML Class E2 Weights
0.1	0.095	OIML Class E2 Weights
1	0.75	OIML Class E2 Weights
10	7.5	OIML Class E2 Weights
100	75	OIML Class E2 Weights

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THERMODYNAMIC

NVLAP Code: 20/T02

Humidity

Range in %	Best Uncertainty (\pm) in % ^{Note 1}	Remarks
10 to 95 RH	1.2	2500

NVLAP Code: 20/T03

Laboratory Thermometers

RTD's, Thermistors, and Direct Reading Thermometers

Range in °C	Best Uncertainty (\pm) in °C ^{Note 1}	Remarks
0 to 100	0.0093	Water Bath
100 to 419	0.265	Fluidized Bath

Thermocouples

Thermocouple Type	Best Uncertainty (\pm) in °C ^{Note 1} (Range 0 to 100 °C in Water)	Best Uncertainty (\pm) in °C ^{Note 1} (Range 100 to 419 °C in Fluidized Bath)
B	n/a	1.359
C	0.197	0.368
E	0.177	0.357
J	0.178	0.358
K	0.179	0.358
R	0.282	0.390
S	0.279	0.391
T	0.179	0.358

NVLAP Code: 20/T05

Pressure

Absolute Mode

Range	Best Uncertainty (\pm) in ppm of Reading + mPa (psi) ^{note 1}	Remarks
1.0 Pa to 15 kPa	37 + 8	FPG 8601

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0.000145 psia to 2.17 psia

37 + (1.2 E-6)

FPG 8601

Range	Best Uncertainty (\pm) in ppm of Reading + Pa ^{note 1}	Remarks
10 to 380 kPa (1.45 to 55 psia)	15.7 + 0.10	7601 (10 kPa/kg)
50 to 1900 kPa (7.3 to 275 psia)	18.0 + 0.12	7601 (50 kPa/kg)
200 to 7600 kPa (29 to 1100 psia)	19.9 + 0.25	7601 (200 kPa/kg)

Absolute Differential Mode

Range	Best Uncertainty (\pm) in ppm of Reading + mPa (psi) ^{note 1}	Remarks
0 Pa to 15 kPa	37 + 5	FPG 8601
0 psia to 2.17 psia	37 + (7.3 E-7)	FPG 8601

Gauge Mode	Best Uncertainty (\pm) in ppm of Reading + mPa (psi) ^{note 1}	Remarks
0 Pa to 15 kPa	37 + 5	FPG 8601
0 psi to 2.17 psi	37 + (7.3 E-7)	FPG 8601

Range	Best Uncertainty (\pm) in ppm ^{note 1}	Remarks
10 to 380 kPa (1.45 to 55 psi)	16.0 + 0.01 Pa	7601 (10 kPa/kg)
50 to 1900 kPa (7.3 to 275 psi)	18.3 + 0.06 Pa	7601 (50 kPa/kg)
200 to 7600 kPa (29 to 1100 psi)	20.2 + 0.23 Pa	7601 (200 kPa/kg)
1.379 MPa to 68.948 MPA	108	5202
200 psig to 10 000 psig	108	5202

NVLAP Code: 20/T07
Resistance Thermometry

Range in °C	Best Uncertainty (\pm) in mK	Remarks
0.01	1.0	TPW
29.7646	2.0	GaMP

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231.928	4.0	Sn FP
419.527	8.0	Zn FP

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1. Represents an expanded uncertainty using a coverage factor, $k = 2$, at an approximate level of confidence of 95 %.
 2. This parameter is accredited for field service, reported uncertainties may be higher due to environmental conditions.

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