National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 105000-0**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Oak Ridge Metrology Center	Fields of Calibration
P. O. Box 2009, MS8091 Oak Ridge, TN 37831-8091 Mr. Nick Eastman Phone: 865-576-1532 Fax: 865-574-2802 E-mail: eastmanns@y12.doe.gov URL: http://www.y12.doe.gov/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, 8, 9	Remarks
DIMENSIONAL			
GAGE BLOCKS (20/D03)			
Steel and Chrome Only	<0.1 in 0.1 in to 1.0 in > 1.0 in to 4.0 in <2.6 mm 2.6 mm to 25 mm > 25 mm to 100 mm	3.0 µin 2.6 µin (2.3 + 0.2L) µin 0.08 µm 0.07 µm (0.06 + 0.2L) µm	Mechanical Comparison Mechanical Comparison
LENGTH and DIAMETER; STEP GAGES (20/D05)			
Length	0 m to 1.2 m	(0.31 + 0.58L) µm	Moore M48 CMM
LINE STANDARDS (20/D06)			
Line Standards	0 mm to 600 mm	(0.79 + 0.39L) µm	CMM (optical)
OPTICAL REFERENCE PLANES (20/D08)			
Glass Reticles, Stage Micrometer, Glass Magnification Scales and Calibration Charts Optical Grid Plates/Reference Planes	Field-of-View 0 mm to 848 mm	1.5 µm (0.45 0.78L) µm	CMM (optical), Measurements taken within camera field-of-view CMM (optical)

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) Note 3, 8, 9	Remarks
ROUNDNESS (20/D09)			
Diameter	152.4 mm	0.025 µm	Roundness Instrument; 6 in
Height	101.6 mm	0.025 µm	4 in
SPHERICAL DIAMETER; PLUG / RING GAGES (20/D11)			
Spherical Diameter	≤ 4 in	16 µin	Supermicrometer
Cylindrical Diameter	≤ 1 in	12 µin	
Ring Gages (inside diameter)	to 0.91 m	(0.28+ 1.2L) µm	Moore M48 CMM; 36 in
SURFACE TEXTURE (20/D12)			
Ra (Roughness Average)	41 µin to 120 µin (1.04 µm to 3.05 µm) 13 µin to 40 µin (0.33 µm to 1.02 µm) 12 µin (0.31 µm)	5.4 µin (0.14 µm) 4.1 µin (0.10 µm) 1.2 µin (0.03 µm)	Surfcom Profilometer
TWO DIMENSIONAL GAGES (20/D15)			
Diagonal	0 m to 1.3 m	(0.40 + 2.0L) µm	Moore M48 CMM
COORDINATE MEASUREING MACHINES (20/D16)			
Diagonal (3D)	0 m to 1.4 m	(0.73 + 2.5L) µm	Spatial Moore M48 CMM
GEARS (20/D18)			
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

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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
ELECTROMAGNETICS – DC/LOW FREQUENCY				
AC RESISTORS and CURRENT (20/E02)				
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	
		> 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	0.014 % + 2.6 µA	
		> 1 kHz to 5 kHz	0.022 % + 3.6 µA	
		> 5 kHz to 10 kHz	0.11 % + 10 µA	
	> 220 mA to 2.2 A	20 Hz to 1kHz	0.027 % + 35 µA	
		> 1 kHz to 5 kHz	0.046 % + 80 µA	
		> 5 kHz to 10 kHz	0.70 % + 0.16 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	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) Note 3, 5	Remarks
		> 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	
		> 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	0.065 % + 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	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) Note 3, 5	Remarks
DC RESISTANCE and CURRENT (20/E05)			
DC Resistance Fixed Points	20 µΩ (to 1000 A)	0.025 %	L&N 4372 Shunt
			L&N 4364 Shunts
(Shunts in air)	0.001 Ω (to 500 A)	0.025 %	
	0.01 Ω (to 100 A)	0.025 %	L&N 4361 Shunts
	0.1 Ω (to 15 A)	0.025 %	L&N 4360 Shunts

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) Note 3, 5	Remarks
DC Resistance Fixed Points (in air)	1 Ω	7.0 μΩ/Ω	Fluke 742A-1
	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 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	
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	

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) Note 3, 5	Remarks
	> 2.2 A to 11 A	0.037 % + 0.48 mA	Fluke 5725A Amplifier
	> 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
DC VOLTAGE (20/E06)			
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 + 0.50 mV	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) Note 3, 5	Remarks
LF AC VOLTAGE (20/E09)				
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	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) Note 3, 5	Remarks
		> 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	
		> 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	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) Note 3, 5	Remarks
		> 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	2.2 x 10^7 V-Hz
		> 300 kHz to 500 kHz	0.59 % + 40 mV	2.2 x 107 V-Hz
		> 500 kHz to 1 MHz	0.89 % + 80 mV	2.2 x 107 V-Hz
	> 220 V to 1000 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	
		> 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	

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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
	> 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 % + 20 mV	
		> 300 kHz to 1 MHz	1.0 % + 2.0 V	
	> 200 V to 1000 V	1 Hz to 10 Hz	0.016 % + 70 mV	
		> 10 Hz to 40 Hz	0.012 % + 20 mV	
		> 40 kHz to 10 kHz	0.012 % + 20 mV	
		> 10 kHz to 30 kHz	0.023 % + 40 mV	
		> 30 kHz to 100 kHz	0.058 % + 0.20 V	

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) Note 3,	Remarks
TIME and FREQUENCY			
FREQUENCY DISSEMINATION (20/F01)			
Frequency Measure	1 MHz 5 MHz 10 MHz	1×10^{-12} 1×10^{-12} 1×10^{-12}	NIST FMAS + Fluke 910R
MECHANICAL			
MASS DETERMINATION (20/M08)			
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 500 mg 200 mg 100 mg 50 mg 20 mg 10 mg 5 mg 2 mg 1 mg	27 mg 17 mg 14 mg 7.0 mg 2.6 mg 1.9 mg 1.9 mg 1.2 mg 0.18 mg 0.11 mg 0.076 mg 0.035 mg 0.016 mg 0.010 mg 0.0068 mg 0.0032 mg 0.0031 mg 0.0030 mg 0.0030 mg 0.0030 mg 0.0026 mg 0.0026 mg 0.0026 mg 0.0023 mg 0.0023 mg 0.0023 mg	Echelon II

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) Note 3,	Remarks
TORQUE (20/M15)			
Torque Measure	5 lb-in to 50 lb-in 30 lb-in to 400 lb-in 80 lb-in to 1000 lb-in 20 lbf to 250 lbf	0.32 % 0.40% 0.39% 0.31%	TTC 400 Torque Calibrator

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Test Load Range	Readability	Uncertainty (k=2) Note 3	Remarks
CALIBRATION OF WEIGHING INSTRUMENTS (20/M16)				
Balances Field calibrations available Note 4	30 kg 20 kg 10 kg 1 kg 100 g 10 g 1 g	1 g 0.1 g 0.01 g 1 mg 0.1 mg 0.01 mg 0.001 mg	1.3 g 0.13 g 12 mg 1.3 mg 0.13 mg 0.13 mg 0.0016 mg	

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) Note 3, 5	Remarks
THERMODYNAMIC			
LABORATORY THEMOMETERS, DIGITAL and ANALOG (20/T03)			
Temperature Measuring Devices Note 4	-90 °C to 0 °C	0.051 °C	Ametek HTC 125A Dry Well w/SPRT and 1594A Digital Readout
	0 °C to 30 °C	0.0032 °C	7012 Liquid Bath w./SPRT and 1594A Digital Readout
	0 °C to 125 °C	0.012 °C	Ametek HTC 125A Dry Well w/SPRT and 1594A Digital Readout
	126 °C to 420 °C	0.044 °C	9173 Dry Well w/SPRT and 1594A Digital Readout

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	421 °C to 700 °C	0.26 °C	9173 Dry Well w/ 5624 PRT
	701 °C to 1000 °C	0.43 °C	9112 Tube Furnace w/ 5624 PRT
LEAK ARTIFACTS (20/T04)			
Leal Artifacts	1.0×10^{-4} atm cc/sec to 9.9×10^{-4} atm cc/sec	3.8 %	Vacuum Decay Method
	1.0×10^{-5} atm cc/sec to 9.9×10^{-5} atm cc/sec	2.8 %	
	1.0×10^{-6} atm cc/sec to 9.9×10^{-6} atm cc/sec	3.2 %	
	7.0×10^{-7} atm cc/sec to 9.9×10^{-7} atm cc/sec	3.4 %	
	5.0×10^{-7} atm cc/sec to 6.9×10^{-7} atm cc/sec	3.8 %	
	3.0×10^{-7} atm cc/sec to 4.9×10^{-7} atm cc/sec	4.8 %	
PRESSURE (20/T05)			
Pneumatic Deadweight Piston Gauge (Absolute & Gauge Mode)	1.3 psi to 23.73 psi (9.0 kPa to 164 kPa)	0.0023 %	Direct Pressure Comparison Nitrogen
	23.73 psi to 95.96 psi (164 kPa to 662 kPa)	0.0016 %	
	95.96 psia to 1002.91 psia (662 kPa to 6915 kPa)	0.0017 %	
Hydraulic Deadweight Piston Gauge (Gauge Mode)	202 psig to 3706.21 psig (1.39 MPa to 25.55 MPa)	0.0040 %	Direct Comparison Oil
	3706.2 psig to 19 854 psig (25.5 MPa to 136.9 MPa)	0.0046 %	
	19 853 psig to 39 579 psig (136.9 MPa to 273 MPa)	0.0047 %	

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For the National Institute of Standards and Technology

CALIBRATION LABORATORIES

NVLAP LAB CODE 105000-0

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) Note 3, 5	Remarks
Hydraulic Deadweight Piston Gauge (Gauge Mode)	201.9 psig to 3706.3 psig (1.39 MPa to 25.55 MPa)	0.0041 %	Direct Comparison Nitrogen
	3706.3 psig to 15 000 psig (25.55 MPa to 103.5 MPa)	0.0046 %	
VACUUM and LOW PRESSURE TRANSDUCERS (20/T10)			
Capacitance Diaphragm Gauge		(where x is the applied pressure)	Direct Comparison;
	0.001 Torr to 0.004 Torr	$(0.0045x^{-0.97})$ %	MKS Baratron, 1 Torr
	0.004 Torr to 0.01 Torr	0.80 %	
	0.01 Torr to 1.0 Torr	0.52 %	MKS Baratron 10 Torr
	1.0 Torr to 10 Torr	0.095 %	MKS Baratron, 100 Torr
	10 Torr to 100 Torr	0.30 %	
	100 Torr to 1000 Torr	0.083 %	MKS Baratron, 1000 Torr
Ionization Gauge	1.0×10^{-4} Torr to 1.0×10^{-6} Torr	6.5 %	Direct Comparison; Granville-Phillips 370121
	1.0×10^{-6} Torr to 1.0×10^{-7} Torr	5.5 %	
	1.0×10^{-7} Torr to 1.0×10^{-8} Torr	5.5%	
	1.0×10^{-8} Torr to 1.0×10^{-9} Torr	7.4 %	
Spinning Rotor Gauge	1.0×10^{-4} Torr to 1.0×10^{-7} Torr	1.7 %	Direct Comparison; MKS SRG-2CE
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 with a level of confidence of approximately 95 %, typically using a coverage factor of $k = 2$. However, laboratories may report a coverage factor different than $k = 2$ to achieve the 95 % level of confidence. 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 length in inches

Note 9: L is length in meters

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