



National Voluntary Laboratory Accreditation Program



CALIBRATION LABORATORIES

NVLAP LAB CODE 200894-0

Scope Revised: 2013-01-18

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

| | |
|--|--|
| Transcat – San Juan 281 Calle Matadero Urb Puerto Nuevo San Juan, PR 00920 Mr. John Strouth Phone: 787-706-8855 Fax: 787-792-3614 E-mail: jstrouth@transcat.com URL: www.transcat.com | Parameter(s) of Accreditation Dimensional Electromagnetics – DC/Low Frequency Time and Frequency Mechanical Electromagnetics – RF/Microwave Thermodynamic This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01) |
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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 | | | |
| NVLAP Code: 20/D05 LENGTH & DIAMETER; STEP GAGES | | Where L is the length in inches of device under test. | |
| Micrometers and Calipers— Outside, Inside, Depth | 0.05 in to 10 in | $9 \mu\text{in} + 14L \mu\text{in}$ | Comparison to Gage Blocks |
| Anvil Flatness | 0 in to 1 in | $6.1 \mu\text{in}$ | Optical Flats |
| Rulers | 0 in to 36 in | Where L is the length in feet of device under test. $0.002 \text{ in} + 0.002L \text{ in}$ | Glass Scale with Optics |

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

| Measured Parameter or Device Calibrated | Range | Frequency Range | Uncertainty ($k=2$) <small>Notes 3,5</small> | Remarks |
|---|----------------------|---|---|-------------|
| ELECTROMAGNETICS – DC/LOW FREQUENCY | | | | |
| NVLAP Code: 20/E02 AC RESISTORS AND CURRENT AC Current – Generate | 29 to 329.99 μ A | 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz | 0.16 % + 0.1 μ A 0.12 % + 0.1 μ A 0.097 % + 0.1 μ A 0.23 % + 0.15 μ A 0.62 % + 0.2 μ A 1.2 % + 0.4 μ A | Fluke 5520A |
| | 0.33 to 3.2999 mA | 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz | 0.16 % + 0.15 μ A 0.097 % + 0.15 μ A 0.078 % + 0.15 μ A 0.16 % + 0.2 μ A 0.39 % + 0.3 μ A 0.78 % + 0.6 μ A | |
| | 3.3 to 32.999 mA | 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz | 0.14 % + 2 μ A 0.07 % + 2 μ A 0.031 % + 2 μ A 0.062 % + 2 μ A 0.16 % + 3 μ A 0.31 % + 4 μ A | |
| | 33 to 329.99 mA | 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz | 0.14 % + 20 μ A 0.07 % + 20 μ A 0.031 % + 20 μ A 0.078 % + 50 μ A 0.16 % + 100 μ A 0.31 % + 200 μ A | |
| | 0.33 to 1.1 A | 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz | 0.14 % + 100 μ A 0.039 % + 100 μ A 0.47 % + 1 mA 1.9 % + 5 mA | |

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|---|--------------------------|-----------------|--|-----------------------------|
| AC Current – Generate | 1.1 A to 3 A | 10 Hz to 45 Hz | 0.14 % + 100 μ A | Fluke 5520A |
| | | 45 Hz to 1 kHz | 0.047 % + 100 μ A | |
| | | 1 kHz to 5 kHz | 0.47 % + 1.0 mA | |
| | | 5 kHz to 10 kHz | 1.9 % + 5.0 mA | |
| | 3 A to 11 A | 45 Hz to 100 Hz | 0.047 % + 2 mA | |
| | | 100 Hz to 1 kHz | 0.08 % + 2 mA | |
| | | 1 kHz to 5 kHz | 2.3 % + 2 mA | |
| | 11 A to 20.5 A | 45 Hz to 100 Hz | 0.093 % + 5 mA | |
| | | 100 Hz to 1 kHz | 0.12 % + 5 mA | |
| | | 1 kHz to 5 kHz | 2.3 % + 5 mA | |
| Clamp-on Ammeter (Toroidal Type) | 20 A to 150 A | 45 Hz to 65 Hz | 0.30 % + 26 mA | Fluke 5520A with 5500A/Coil |
| | | 65 Hz to 440 Hz | 0.83 % + 47 mA | |
| | | 45 Hz to 65 Hz | 0.35 % + 0.12 A | |
| | | 65 Hz to 440 Hz | 1.1 % + 0.22 A | |
| Clamp-on Ammeter (Non-Toroidal Type) | 20 A to 150 A | 45 Hz to 65 Hz | 0.57 % + 0.25 A | Fluke 5520A with 5500A/Coil |
| | | 65 Hz to 440 Hz | 1.0 % + 0.25 A | |
| | | 45 Hz to 65 Hz | 0.60 % + 0.90 A | |
| | | 65 Hz to 440 Hz | 1.3 % + 0.92 A | |
| AC Current – Measure | 0 μ A to 100 μ A | 10 Hz to 20 Hz | 0.44 % + 30 nA | Agilent 3458A Option 002 |
| | | 20 Hz to 45 Hz | 0.15 % + 30 nA | |
| | | 45 Hz to 100 Hz | 0.063 % + 30 nA | |
| | | 100 Hz to 5 kHz | 0.063 % + 30 nA | |
| | 100 μ A to 1 mA | 10 Hz to 20 Hz | 0.40 % + 200 nA | |
| | | 20 Hz to 45 Hz | 0.15 % + 200 nA | |
| | | 45 Hz to 100 Hz | 0.062 % + 200 nA | |
| | | 100 Hz to 5 kHz | 0.034 % + 200 nA | |
| | 1 mA to 10 mA | 10 Hz to 20 Hz | 0.40 % + 2 μ A | |
| | | 20 Hz to 45 Hz | 0.15 % + 2 μ A | |
| | | 45 Hz to 100 Hz | 0.062 % + 2 μ A | |

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| Measured Parameter or Device Calibrated | Range | Frequency Range | Uncertainty ($k=2$) <small>Notes 3,5</small> | Remarks |
|---|-----------------|-----------------|--|-----------------------------|
| AC Current – Measure | 10 mA to 100 mA | 100 Hz to 5 kHz | 0.034 % + 2 μ A | Agilent 3458A Option 002 |
| | | 10 Hz to 20 Hz | 0.40 % + 20 μ A | |
| | | 20 Hz to 45 Hz | 0.15 % + 20 μ A | |
| | | 45 Hz to 100 Hz | 0.061 % + 20 μ A | |
| | | 100 Hz to 5 kHz | 0.033 % + 20 μ A | |
| | 100 mA to 1 A | 10 Hz to 20 Hz | 0.40 % + 200 μ A | |
| | | 20 Hz to 45 Hz | 0.16 % + 200 μ A | |
| | | 45 Hz to 100 Hz | 0.085 % + 200 μ A | |
| | | 100 Hz to 5 kHz | 0.10 % + 200 μ A | |

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

| Measured Parameter or Device Calibrated | Range | Uncertainty ($k=2$) <small>Note 3,5</small> | Remarks |
|---|--|--|-----------------------------|
| NVLAP Code: 20/E05 DC RESISTANCE AND CURRENT | | | |
| DC Resistance – Measure | 0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω | 20 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 0.50 m Ω 13 $\mu\Omega/\Omega$ + 0.50 m Ω 12 $\mu\Omega/\Omega$ + 5 m Ω 13 $\mu\Omega/\Omega$ + 50 m Ω 19 $\mu\Omega/\Omega$ + 2 Ω 63 $\mu\Omega/\Omega$ + 100 Ω 590 $\mu\Omega/\Omega$ + 1 k Ω 0.58 % + 10 k Ω | Agilent 3458A Option 002 |
| DC Resistance – Generate | 0 Ω to 11 Ω 11 Ω to 33 Ω 33 Ω to 110 Ω 110 Ω to 330 Ω 330 Ω to 1.1 k Ω 1.1 k Ω to 3.3 k Ω 3.3 k Ω to 11 k Ω 11 k Ω to 33 k Ω | 31 $\mu\Omega/\Omega$ + 1 m Ω 23 $\mu\Omega/\Omega$ + 1.5 m Ω 22 $\mu\Omega/\Omega$ + 1.4 m Ω 22 $\mu\Omega/\Omega$ + 2 m Ω 22 $\mu\Omega/\Omega$ + 2 m Ω 22 $\mu\Omega/\Omega$ + 20 m Ω 22 $\mu\Omega/\Omega$ + 20 m Ω 22 $\mu\Omega/\Omega$ + 0.2 Ω | Fluke 5520A |

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|--|--|---|--------------------------------|
| DC Resistance – Generate | 33 kΩ to 110 kΩ | 22 μΩ/Ω + 0.2 Ω | Fluke 5520A |
| | 110 kΩ to 330 kΩ | 25 μΩ/Ω + 2 Ω | |
| DC Current – Measure | 330 kΩ to 1.1 MΩ | 26 μΩ/Ω + 2 Ω | Agilent 3458A Option 002 |
| | 1.1 MΩ to 3.3 MΩ | 47 μΩ/Ω + 30 Ω | |
| | 3.3 MΩ to 11 MΩ | 120 μΩ/Ω + 50 Ω | |
| | 11 MΩ to 33 MΩ | 200 μΩ/Ω + 2500 Ω | |
| | 33 MΩ to 110 MΩ | 390 μΩ/Ω + 3 kΩ | |
| | 110 MΩ to 330 MΩ | 0.23 % + 100 kΩ | |
| | 330 MΩ to 1 GΩ | 1.2 % + 500 kΩ | |
| | 10 GΩ | 0.64 % | Decade Resistor |
| | 100 GΩ | 1.3 % | |
| | 0 μA to 100 μA | 28 μA/A + 0.8 nA | |
| DC Current – Generate | 100 μA to 1 mA | 29 μA/A + 5 nA | Fluke 5520A |
| | 1 mA to 10 mA | 29 μA/A + 50 nA | |
| | 10 mA to 100 mA | 47 μA/A + 500 nA | |
| | 100 mA to 1 A | 111 μA/A + 10 μA | |
| | 0 μA to 330 μA | 0.012 % + 0.02 μA | |
| | 330 μA to 3.3 mA | 0.0078 % + 0.05 μA | |
| | 3.3 mA to 33 mA | 0.0081 % + 0.25 μA | |
| Clamp-on Ammeter (Non-Toroidal Type) | 33 mA to 330 mA | 0.0078 % + 2.5 μA | Fluke 5520A with 5500A/Coil |
| | 330 mA to 1.1 A | 0.017 % + 40 μA | |
| | 1.1 A to 3 A | 0.040 % + 40 μA | |
| | 3 A to 11 A | 0.050 % + 500 μA | |
| | 11 A to 20 A | 0.082 % + 750 μA | |
| | 20 A to 150 A | 0.50 % + 0.14 A | |
| | 150 A to 1000 A | 0.52 % + 0.50 A | |
| NVLAP Code: 20/E06 DC VOLTAGE DC Voltage – Measure | 0 V to 100 mV 100 mV to 10 V 10 V to 100 V 100 V to 500 V | 10 μV/V + 0.50 μV 5.2 μV/V + 0.50 μV 7.9 μV/V + 30 μV 12 μV/V + 100 μV | Agilent 3458A Option 002 |

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|---|---|--|-----------------------------|
| DC Voltage – Measure | 500 V to 800 V 800 V to 1 kV | 15 μ V/V + 100 μ V 21 μ V/V + 100 μ V | Agilent 3458A Option 002 |
| DC Voltage – Generate | 0 mV to 330 mV 330 mV to 3 V 3 V to 33 V 33 V to 330 V 330V to 1 kV | 16 μ V/V + 1 μ V 8.6 μ V/V + 2 μ V 9.3 μ V/V + 20 μ V 14 μ V/V + 150 μ V 14 μ V/V + 1500 μ V | Fluke 5520A |

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| Measured Parameter or Device Calibrated | Range | Frequency Range | Uncertainty ($k=2$) <small>Notes 3,5</small> | Remarks |
|---|-----------------|---|---|-----------------------------|
| NVLAP Code: 20/E09 LF AC VOLTAGE | | | | |
| AC Voltage – Measure | 0 mV to 10 mV | 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz | 0.039 % + 3 μ V 0.028 % + 1 μ V 0.038 % + 1 μ V 0.15 % + 1 μ V 0.59 % + 1 μ V 4.6 % + 2 μ V | Agilent 3458A Option 002 |
| | 10 mV to 100 mV | 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz | 0.013 % + 4 μ V 0.0094 % + 2 μ V 0.017 % + 2 μ V 0.037 % + 2 μ V 0.093 % + 2 μ V 0.36 % + 10 μ V 1.2 % + 10 μ V | |
| | 100 mV to 1 V | 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz | 0.0098 % + 40 μ V 0.0094 % + 20 μ V 0.017 % + 20 μ V 0.036 % + 20 μ V 0.093 % + 20 μ V 0.35 % + 100 μ V | |

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| Measured Parameter or Device Calibrated | Range | Frequency Range | Uncertainty ($k=2$) <small>Notes 3,5</small> | Remarks |
|---|--------------------|---|---|--------------------------|
| AC Voltage – Measure | 1 V to 10 V | 300 kHz to 1 MHz 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz | 1.2 % + 100 μ V 0.0095 % + 400 μ V 0.0095 % + 200 μ V 0.017 % + 200 μ V 0.036 % + 200 μ V 0.093 % + 200 μ V 0.35 % + 1 mV 1.2 % + 1 mV | Agilent 3458A Option 002 |
| | 10 V to 100 V | 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 1 MHz | 0.024 % + 4 mV 0.024 % + 2 mV 0.024 % + 2 mV 0.041 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV | |
| | 100 V to 700 V | 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz | 0.047 % + 40 mV 0.047 % + 20 mV 0.07 % + 20 mV 0.14 % + 20 mV 0.35 % + 20 mV | |
| AC Voltage – Generate | 1 mV to 32.999 mV | 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz | 0.082 % + 6 μ V 0.014 % + 6 μ V 0.02 % + 6 μ V 0.083 % + 6 μ V 0.27% + 12 μ V 0.62 % + 50 μ V | Fluke 5520A |
| | 33 mV to 329.99 mV | 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz | 0.026 % + 8 μ V 0.012 % + 8 μ V 0.013 % + 8 μ V 0.032 % + 8 μ V | |

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|---|---------------------|--|---|-------------|
| AC Voltage – Generate | | 50 kHz to 100 kHz 100 kHz to 500 kHz | 0.063 % + 32 μ V 0.16 % + 70 μ V | Fluke 5520A |
| | 0.33 V to 3.29999 V | 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz | 0.023 % + 50 μ V 0.012 % + 60 μ V 0.015 % + 60 μ V 0.023 % + 50 μ V 0.054 % + 125 μ V 0.19 % + 600 μ V | |
| | 3.3 V to 32.9999 V | 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz | 0.023 % + 650 μ V 0.012 % + 600 μ V 0.019 % + 600 μ V 0.027 % + 600 μ V 0.07 % + 1.6 mV | |
| | 33 V to 329.999 V | 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz | 0.015 % + 2 mV 0.016 % + 6 mV 0.02 % + 6 mV 0.023 % + 6 mV 0.016 % + 50 mV | |
| | 330 V to 1020 V | 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz | 0.023 % + 10 mV 0.019 % + 10 mV 0.023 % + 10 mV | |

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|--|---|--|---|--|
| NVLAP Code: 20/E10 LOW FREQUENCY CAPACITANCE Capacitance Measuring Equipment | 0 pF to 190 pF 0.19 nF to 1.0999 nF 1.1 nF to 3.2999 nF 3.3 nF to 10.9999 nF 11 nF to 109.999 nF 110 nF to 329.999 nF 0.33 μ F to 1.09999 μ F 1.1 μ F to 3.2999 μ F 3.3 μ F to 10.9999 μ F 11 μ F to 32.9999 μ F 33 μ F to 109.9999 μ F 110 μ F to 329.999 μ F 0.33 mF to 1.09999 mF 1.1 mF to 3.299999 mF 3.3 mF to 10.9999 mF 11 mF to 32.9999 mF 33 mF to 110 mF | 1 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 600 Hz 10 Hz to 300 Hz 10 Hz to 150 Hz 10 Hz to 120 Hz 10 Hz to 80 Hz DC to 50 Hz DC to 20 Hz DC to 6 Hz DC to 2 Hz DC to 0.6 Hz DC to 0.2 Hz | 0.06 % + 5 pF 0.4 % + 7.8 pF 0.39 % + 7.8 pF 0.20 % + 7.8 pF 0.20 % + 78 pF 0.20 % + 0.23 nF 0.20 % + 0.78 nF 0.20 % + 2.3 nF 0.20 % + 7.8 nF 0.32 % + 23 nF 0.35 % + 78 nF 0.37 % + 0.23 μ F 0.37 % + 0.78 μ F 0.35 % + 2.3 μ F 0.35 % + 7.8 μ F 0.58 % + 23 μ F 0.85 % + 78 μ F | Decade Capacitor Fluke 5520A |
| NVLAP Code: 20/E12 LF POWER/ENERGY Power – Measuring Equipment (for current range listed below) DC Power | 0.33 mA to 330 mA 0.33 A to 3 A | 11 μ W to 1.1 mW 1.1 mW to 110 mW 0.11W to 110 W 110 W to 330 W 11 W to 110 mW 0.11 W to 990 W 1 W to 3 kW | DC DC DC DC DC DC DC | 0.024 % 0.027 % 0.024 % 0.018 % 0.044 % 0.053 % 0.0096 % |
| | | | | Fluke 5520A |

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|---|---|---|---|-------------|
| 3 A to 20.5 A | 0.099 W to 0.99 W 0.99 W to 6.8 kW 6.8 W to 20.5 kW | DC DC DC | 0.088 % 0.07 % 0.04 % | |
| AC Power ^{Note 8} (PF = 1) 3.3 mA to 9 mA | 0.11 mW to 3 mW 3 mW to 9 W | 10 Hz to 65 Hz 10 Hz to 65 Hz | 0.13 % 0.077 % | |
| 9 mA to 33 mA | 0.3 mW to 10 mW 10 mW to 33 W | 10 Hz to 65 Hz 10 Hz to 65 Hz | 0.089 % 0.077 % | |
| 33 mA to 90 mA | 1 mW to 30 mW 30 mW to 90 W | 10 Hz to 65 Hz 10 Hz to 65 Hz | 0.071 % 0.057 % | |
| 90 mA to 330 mA | 3.0 mW to 100 mW 100 mW to 300 W | 10 Hz to 65 Hz 10 Hz to 65 Hz | 0.089 % 0.078 % | |
| 0.33 A to 0.9 A | 11 mW to 300 mW 300 mW to 900 W | 10 Hz to 65 Hz 10 Hz to 65 Hz | 0.071 % 0.081 % | |
| 0.9 A to 2.2 A | 30 mW to 720 mW 720 mW to 2 kW | 10 Hz to 65 Hz 10 Hz to 65 Hz | 0.089 % 0.079 % | |
| 2.2 A to 4.5 A | 80 mW to 1.4 W 1.4 W to 4.5 kW | 10 Hz to 65 Hz 10 Hz to 65 Hz | 0.088 % 0.18 % | |
| 4.5 A to 20.5 A | 150 mW to 6.7 W 6.7 W to 20 kW | 10 Hz to 65 Hz 10 Hz to 65 Hz | 0.17 % 0.17 % | |
| NVLAP Code: 20/E15 PHASE METERS LF Phase – Generate | 0° to 179.99° | 10 Hz to 65 Hz 65 Hz to 500 Hz 500 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 20 kHz | 0.10° 0.20° 0.40° 1.9° 3.9° 7.8° | Fluke 5520A |

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|--|--|--|---------------------|
| TIME AND FREQUENCY | | | |
| NVLAP Code: 20/F01 FREQUENCY DISSEMINATION Frequency – Measuring Equipment and Measure | 10 MHz | Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise and gating errors 5.8×10^{-10} | Rubidium Oscillator |
| NVLAP Code: 20/F04 PULSE WAVEFORM Rise Time – Generate | ≥ 300 ps | 2.9 % | Fluke 5520A/SC600 |
| MECHANICAL | | | |
| NVLAP Code: 20/M08 MASS Mass – Metric | 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 500 mg 300 mg 200 mg 100 mg 50 mg | 4.0 mg 2.0 mg 1.3 mg 0.97 mg 0.40 mg 0.20 mg 0.12 mg 90 μ g 55 μ g 28 μ g 18 μ g 14 μ g 9.3 μ g 5.2 μ g 4.0 μ g 3.5 μ g 3.4 μ g 1.5 μ g 1.5 μ g 1.5 μ g 1.5 μ g 1.5 μ g | Echelon II |

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|---|--------|--|-------------|
| | 30 mg | 1.5 μ g | |
| | 20 mg | 1.5 μ g | |
| | 10 mg | 1.5 μ g | |
| | 5 mg | 1.5 μ g | |
| | 3 mg | 1.5 μ g | |
| | 2 mg | 1.5 μ g | |
| | 1 mg | 1.5 μ g | |
| | 25 kg | 0.23 g | Echelon III |
| | 20 kg | 0.23 g | |
| | 10 kg | 10 mg | |
| | 5 kg | 5.0 mg | |
| | 3 kg | 3.1 mg | |
| | 2 kg | 2.1 mg | |
| | 1 kg | 1.0 mg | |
| | 500 g | 0.51 mg | |
| | 300 g | 0.30 mg | |
| | 200 g | 0.21 mg | |
| | 100 g | 0.11 mg | |
| | 50 g | 55 μ g | |
| | 30 g | 28 μ g | |
| | 20 g | 29 μ g | |
| | 10 g | 20 μ g | |
| | 5 g | 12 μ g | |
| | 3 g | 12 μ g | |
| | 2 g | 12 μ g | |
| | 1 g | 12 μ g | |
| | 500 mg | 3.5 μ g | |
| | 300 mg | 3.5 μ g | |
| | 200 mg | 3.5 μ g | |
| | 100 mg | 3.5 μ g | |
| | 50 mg | 3.5 μ g | |
| | 30 mg | 3.5 μ g | |
| | 20 mg | 3.5 μ g | |
| | 10 mg | 3.5 μ g | |
| | 5 mg | 3.5 μ g | |

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|---|--------|--|----------------------|
| Balances – Metric | 3 mg | 3.5 μ g | ASTM Class 1 Weights |
| | 2 mg | 3.5 μ g | |
| | 1 mg | 3.5 μ g | |
| | 10 kg | 29 mg | |
| | 5 kg | 14 mg | |
| | 3 kg | 8.9 mg | |
| | 2 kg | 5.8 mg | |
| | 1 kg | 2.9 mg | |
| | 500 g | 1.4 mg | |
| | 300 g | 0.87 mg | |
| | 200 g | 0.58 mg | |
| | 100 g | 0.29 mg | |
| | 50 g | 0.14 mg | |
| | 30 g | 0.086 mg | |
| | 20 g | 0.086 mg | |
| | 10 g | 0.060 mg | |
| | 5 g | 0.040 mg | |
| | 3 g | 0.040 mg | |
| | 2 g | 0.040 mg | |
| | 1 g | 0.040 mg | |
| | 500 mg | 0.010 mg | |
| | 200 mg | 0.010 mg | |
| | 100 mg | 0.010 mg | |
| | 50 mg | 0.010 mg | |
| | 30 mg | 0.010 mg | |
| | 20 mg | 0.010 mg | |
| | 10 mg | 0.010 mg | |
| | 5 mg | 0.010 mg | |
| | 3 mg | 0.010 mg | |
| | 2 mg | 0.010 mg | |
| | 1 mg | 0.010 mg | |
| Balances – Avoirdupois | 50 lb | 2.3 g | ASTM Class 4 Weights |
| | 30 lb | 1.4 g | |
| | 20 lb | 0.91 g | |

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CALIBRATION LABORATORIES

NVLAP LAB CODE 200894-0

Scope Revised: 2013-01-18

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

| Measured Parameter or Device Calibrated | Range | Uncertainty ($k=2$) <small>Notes 3,5</small> | Remarks |
|--|---|--|-------------------|
| | 10 lb 5 lb 3 lb 2 lb 1 lb 8 oz 4 oz 2 oz 1 oz 0.5 oz | 0.46 g 0.23 g 0.14 g 91 mg 46 mg 23 mg 12 mg 5.7 mg 2.9 mg 1.4 mg | |
| ELECTROMAGNETICS – RF/MICROWAVE | | | |
| NVLAP Code: 20/R11 RF-DC VOLTAGE/ CURRENT CONVERTER | | | |
| Sine Wave Flatness | 50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz | 1.9 % + 100 μ V 2.3 % + 100 μ V 4.1 % + 100 μ V | Fluke 5520A/SC600 |

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

| Measured Parameter or Device Calibrated | Range | Uncertainty ($k=2$) <small>Notes 3,5</small> | Remarks |
|--|--|--|-------------------------|
| THERMODYNAMIC | | | |
| NVLAP Code: 20/T02 HUMIDITY Relative Humidity | 10 % to 95 % | 0.60 % | Thunder Scientific 2500 |
| NVLAP Code: 20/T05 PRESSURE Absolute Pressure – Source | 0 psia to 25 psia 25 psia to 500 psia | 0.0019 psia 0.0065 % + 0.001 psia | Ruska 7250xi |
| Gage Pressure – Pneumatic | -15 psi to 25 psi 25 psi to 500 psi | 0.0016 psi 0.0065 % | Ruska 7250xi |

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

| Measured Parameter or Device Calibrated | Range | Uncertainty ($k=2$) <small>Notes 3,5</small> | Remarks |
|---|---|---|--|
| Gage Pressure – Hydraulic | -36 inH ₂ O to -22 inH ₂ O -22 inH ₂ O to 22 inH ₂ O 22 inH ₂ O to 60 inH ₂ O 60 inH ₂ O to 72 inH ₂ O 72 inH ₂ O to 804 inH ₂ O 100 psi to 15 000 psi | 0.0090 % + 150 μ inH ₂ O 0.0020 inH ₂ O 0.0090 % + 150 μ inH ₂ O 0.0065 inH ₂ O 0.0090 % + 150 μ inH ₂ O 0.0090 % | DHI PPC 4 Controller Ametek T-150 Deadweight Tester |
| NVLAP Code: 20/T03 LABORATORY THERMOMETERS, DIGITAL AND ANALOG | | | |
| Temperature – Generate | -30 °C to 125 °C | 0.034 °C | Liquid Bath with Indicator and SPRT |
| Temperature – Measure | -195 °C to 0 °C 0 °C to 440 °C 440 °C to 660 °C | 0.011 °C + 0.001 % 0.02 °C + 0.001 % 0.027 °C + 0.001 % | SPRT with Indicator |

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

| Measured Parameter or Device Calibrated | Type | Range | Uncertainty ($k=2$) <small>Note 3</small> | Remarks |
|--|---------------------------|--|--|--|
| NVLAP Code: 20/T08 TEMPERATURE INDICATORS | | | | |
| Electrical Calibration of Thermocouple Devices | J K T E R | -210 °C to 1200 °C -270 °C to 1372 °C -270 °C to 400 °C -270 °C to 1000 °C 0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C | 0.10 °C 0.10 °C 0.10 °C 0.10 °C 0.45 °C 0.29 °C 0.28 °C 0.37 °C | Thermocouple Half Junctions Fluke 5520A |

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| Measured Parameter or Device Calibrated | Type | Range | Uncertainty ($k=2$) ^{Note 3} | Remarks |
|--|------|--------------------|---|-------------|
| Electrical Calibration of Thermocouple Devices | S | 0 °C to 250 °C | 0.38 °C | Fluke 5520A |
| | | 250 °C to 1000 °C | 0.30 °C | |
| | | 1000 °C to 1400 °C | 0.30 °C | |
| | | 1400 °C to 1767 °C | 0.37 °C | |
| | N | -200 °C to -100 °C | 0.33 °C | |
| | | -100 °C to -25 °C | 0.20 °C | |
| | | -25 °C to 120 °C | 0.18 °C | |
| | | 120 °C to 410 °C | 0.17 °C | |
| | | 410 °C to 1300 °C | 0.23 °C | |
| | | 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: The uncertainties shown are for the most favorable conditions. There is an increase in uncertainty that corresponds to the laboratory's AC voltage and current uncertainties at different frequencies other than the ones shown. Power factors (PF) other than the one shown contribute to the power uncertainty. PF is related to the cosine of phase. Therefore, uncertainties track the laboratory's phase uncertainty closely at PF near one, but are magnified heavily as PF approaches zero. The lab may also report reactive power, apparent power, and power factor under this accreditation. If needed, contact laboratory for more information regarding uncertainties at frequency and power factor combinations other than the ones shown.

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