

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200904-0

Masy BioServices
Pepperell, MA

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

Calibration Laboratories

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2022-03-14 through 2023-03-31

Effective Dates



A handwritten signature in blue ink, reading 'Dana S. Laman'.

For the National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES

NVLAP LAB CODE 200904-0


SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

| | |
|---|---|
| <p>Masy BioServices 27 Lomar Park Drive Pepperell, MA 01463-1486 Mr. Keith Kelly Phone: 978-433-6279 Fax: 978-433-0442 E-mail: keith.kelly@masy.com URL: http://www.masy.com</p> | <p>Fields of Calibration Electromagnetics – DC/Low Frequency Time & Frequency Mechanical Thermodynamic</p> |
|---|---|

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks |
|--|------------------|---|---|-----------------------|
| ELECTROMAGNETICS – DC/LOW FREQUENCY | | | | |
| AC RESISTANCE and CURRENT (20/E02) | | | | |
| AC Current – Source | 0 µA to 220 µA | 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz | 270 µA/A + 140 nA 180 µA/A + 31 nA 130 µA/A + 6.4 nA 290 µA/A + 9.5 nA 0.11 % + 51 nA | Fluke 5720A Series II |
| | 220 µA to 2.2 mA | 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz | 270 µA/A + 290 nA 180 µA/A + 30 nA 140 µA/A + 30 nA 220 µA/A + 87 nA 0.11 % + 510 nA | |
| | 2.2 mA to 22 mA | 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz 10 kHz | 270 µA/A + 1.6 µA 170 µA/A + 1.6 µA 130 µA/A + 0.28 µA 210 µA/A + 0.43 µA 0.11 % + 3.9 µA | |
| | 22 mA to 220 mA | 10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz 10 kHz | 270 µA/A + 5.6 µA 170 µA/A + 18 µA 130 µA/A + 2 µA 210 µA/A + 2.8 µA 0.11 % + 8.2 µA | |

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| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks |
|--|---------------------|--|--|---------------------------------|
| Clamp on Ammeters (Non-Toroidal/Hall Effect) | 220 mA to 2.2 A | 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz | 270 μ A/A + 31 μ A 470 μ A/A + 63 μ A 0.71 % + 130 μ A | |
| | 2.2 A to 11 A | 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz | 500 μ A/A + 190 μ A 0.1 % + 310 μ A 0.38 % + 2.2 mA | Fluke 5720A w/5725A |
| | 11 A to 20.5 A | 45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz | 0.094 % + 4.1 mA 0.12 % + 4.1 mA 2.4 % + 4.1 mA | Fluke 5522A |
| | 20.5 A to 41 A | 45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz | 0.13 % + 27 mA 0.17 % + 27 mA 3.3 % + 27 mA | Dual 5522A's in parallel |
| | 20.5 A to 150 A | 45 Hz to 65 Hz 65 Hz to 440 Hz | 0.57 % + 0.25 A 1.0 % + 0.25 A | Fluke 5522A w/5500A/Coil |
| Clamp on Ammeters (Torodial/Transformer) | 150 A to 1000 A | 45 Hz to 65 Hz 65 Hz to 440 Hz | 0.57 % + 0.92 A 1.3 % + 0.94 A | |
| | 20.5 A to 150 A | 45 Hz to 65 Hz 65 Hz to 440 Hz | 0.3 % + 0.04 A 0.83 % + 0.041 A | Fluke 5522A w/5500A/Coil |
| AC Current – Measure and measuring equipment | 150 A to 1000 A | 45 Hz to 65 Hz 65 Hz to 440 Hz | 0.3 % + 0.16 A 1.1 % + 0.24 A | |
| | 0 A (floor) | 10 Hz to 10 kHz | 0.1 μ A | Fluke 8508A w/Current source |
| | 0A to 200 μ A | 10 Hz to 10 kHz | 480 μ A/A + 37 nA | |
| | 200 μ A to 2 mA | 10 Hz to 10 kHz | 290 μ A/A + 350 nA | |
| | 2 mA to 20 mA | 10 Hz to 10 kHz | 330 μ A/A + 4 μ A | |
| | 20 mA to 200 mA | 10 Hz to 10 kHz | 270 μ A/A + 23 μ A | |
| | 200 mA to 2 A | 10 Hz to 2 kHz | 610 μ A/A + 210 μ A | |

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

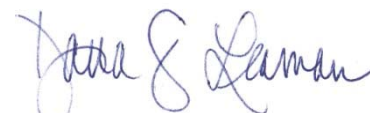
| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks |
|---|-------------|--|--|---------|
| | 2 A to 20 A | 2 kHz to 10 kHz 10 Hz to 2 kHz 2 kHz to 10 kHz | 840 μ A/A + 210 μ A 820 μ A/A + 2 mA 0.26 % + 2 mA | |

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Note 3} | Remarks |
|---|---|---|-----------------------|
| DC RESISTANCE and CURRENT (20/E05) | | | |
| Resistance - Source | 1 Ω 10 Ω 25 Ω 50 Ω 100 Ω 400 Ω 10 k Ω 40 k Ω 100 k Ω 300 k Ω | 5.0 $\mu\Omega$ 20 $\mu\Omega$ 50 $\mu\Omega$ 0.20 m Ω 0.20 m Ω 1.0 m Ω 20 m Ω 0.20 Ω 0.4 Ω 2.0 Ω | MI 9331 Air Resistor |
| DC Resistance - Source | 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω 1 M Ω 1.9 M Ω 10 M Ω | 97 $\mu\Omega$ 180 $\mu\Omega$ 240 $\mu\Omega$ 450 $\mu\Omega$ 1 m Ω 2 m Ω 9.1 m Ω 17 m Ω 88 m Ω 170 m Ω 1.4 Ω 2.4 Ω 22 Ω 43 Ω 420 Ω | Fluke 5720A Series II |

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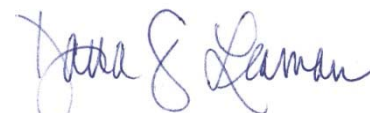
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| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Note 3} | Remarks | |
|--|-------------------|--|---|------------------------|
| Resistance – Measure and measuring equipment | 19 MΩ | 930 Ω | Fluke 8508 w/air resistor in ratio mode | |
| | 100 MΩ | 12 kΩ | | |
| | 0 Ω to 2 Ω | 2.1 μΩ/Ω + 11 μΩ | | |
| | 2 Ω to 20 Ω | 0.65 μΩ/Ω + 11 μΩ | | |
| | 20 Ω to 200 Ω | 0.65 μΩ/Ω + 70 μΩ | | |
| | 200 Ω to 2 kΩ | 0.65 μΩ/Ω + 940 μΩ | | |
| | 2 kΩ to 20 kΩ | 0.65 μΩ/Ω + 20 mΩ | | |
| | 20 kΩ to 200 kΩ | 0.65 μΩ/Ω + 140 mΩ | | |
| | 200 kΩ to 2 MΩ | 0.80 μΩ/Ω + 2.1 Ω | | |
| | 0 Ω (floor) | 4.5 μΩ | | Fluke 8508A w/resistor |
| | 0 Ω to 2 Ω | 17 μΩ/Ω + 6.2 μΩ | | |
| | 2 Ω to 20 Ω | 7.8 μΩ/Ω + 44 μΩ | | |
| | 20 Ω to 200 Ω | 7.6 μΩ/Ω + 65 μΩ | | |
| | 200 Ω to 2 kΩ | 7.5 μΩ/Ω + 510 μΩ | | |
| 2 kΩ to 20 kΩ | 7.5 μΩ/Ω + 5.8 mΩ | | | |
| 20 kΩ to 200 kΩ | 7.6 μΩ/Ω + 630 mΩ | | | |
| 200 kΩ to 2 MΩ | 8.3 μΩ/Ω + 6.4 Ω | | | |
| 2 MΩ to 20 MΩ | 9.7 μΩ/Ω + 14 Ω | | | |
| 20 MΩ to 200 MΩ | 24 μΩ/Ω + 1 kΩ | | | |
| Clamp on Ammeter Non-Toroidal/Hall effect | 20.5 A to 150A | 0.51 % + 0.15 A | Fluke 5522A w/5500A/Coil | |
| | 150 A to 1000 A | 0.51 % + 0.59 A | | |
| DC Current – Source | 0 A to 220 μA | 41 μA/A + 4.7 nA | Fluke 5720A Series II | |
| | 220 μA to 2.2 mA | 36 μA/A + 5.5 nA | | |
| | 2.2 mA to 22 mA | 36 μA/A + 33 nA | | |
| | 22 mA to 220 mA | 46 μA/A + 0.68 μA | | |
| | 220 mA to 2.2 A | 82 μA/A + 11 μA | | |
| | 2.2 A to 11 A | 370 μA/A + 380 μA | | |
| | 11 A to 20.5 A | 790 μA/A + 850 μA | | |
| 20.5 A to 41 A | 0.11 % + 2 mA | Fluke 5522A Dual 5522As in Parallel | | |

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| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Note 3} | Remarks |
|--|-----------------|--|----------------------------------|
| DC Current – Measure and measuring equipment | 0 A (floor) | 0.41 nA | Fluke 8508A w/current source |
| | 0 µA to 200 µA | 12 µA/A + 0.41 nA | |
| | 200 µA to 2 mA | 13 µA/A + 4.1 nA | |
| | 2 mA to 20 mA | 14 µA/A + 42 nA | |
| | 20 mA to 200 mA | 37 µA/A + 860 nA | |
| | 200 mA to 2 A | 170 µA/A + 19 µA | |
| | 2 A to 20 A | 390 µA/A + 650 µA | |
| | 20 A to 100 A | 0.3 % | 8508A w/Shunt and Current Source |
| DC VOLTAGE (20/E06) | | | |
| DC Voltage - Source | 0 mV to 200 mV | 8.6 µV/V + 0.57 µV | Fluke 5720A Series II |
| | 200 mA to 2 V | 5.6 µV/V + 0.81 µV | |
| | 2 V to 10 V | 4.3 µV/V + 3.3 µV | |
| | 10 V to 20 V | 4.3 µV/V + 4.5 µV | |
| | 20 V to 200 V | 5.6 µV/V + 45 µV | |
| | 200 V to 1100 V | 7.0 µV/V + 510 µV | |
| DC Voltage – Measure and measuring equipment | 0 V (floor) | 110 nV | Fluke 8508A w/voltage source |
| | 0 V to 200 mV | 5.1 µV/V + 0.14 µV | |
| | 200 mV to 2 V | 3.4 µV/V + 0.52 µV | |
| | 2 V to 20 V | 3.1 µV/V + 4.3 µV | |
| | 20 V to 200 V | 4.7 µV/V + 49 µV | |
| | 200 V to 1050 V | 4.9 µV/V + 650 µV | |

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks |
|---|-------------|--------------------|--|-----------------------|
| AC VOLTAGE (20/E09) | | | | |
| AC Voltage – Source | 0 V to 2 mV | 10 Hz to 20 Hz | 560 µV/V + 30 µV | Fluke 5720A Series II |
| | | 20 Hz to 40 Hz | 480 µV/V + 30 µV | |
| | | 40 Hz to 20 kHz | 510 µV/V + 4.2 µV | |
| | | 20 kHz to 50 kHz | 540 µV/V + 4.2 µV | |
| | | 50 kHz to 100 kHz | 860 µV/V + 5.2 µV | |
| | | 100 kHz to 300 kHz | 0.11 % + 10 µV | |

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| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks |
|---|--------------------|--------------------|--|---------|
| | 2 mV to 20 mV | 300 kHz to 500 kHz | 0.20 % + 20 μV | |
| | | 500 kHz to 1 MHz | 0.34 % + 21 μV | |
| | 20 mV to 200 mV | 10 Hz to 20 Hz | 260 μV/V + 4.1 μV | |
| | | 20 Hz to 40 Hz | 120 μV/V + 4.1 μV | |
| | | 40 Hz to 20 kHz | 120 μV/V + 4.1 μV | |
| | | 20 kHz to 50 kHz | 230 μV/V + 4.1 μV | |
| | | 50 kHz to 100 kHz | 530 μV/V + 5.1 μV | |
| | | 100 kHz to 300 kHz | 0.11 % + 11 μV | |
| | | 300 kHz to 500 kHz | 0.15 % + 23 μV | |
| | | 500 kHz to 1 MHz | 0.28 % + 28 μV | |
| | 200 mV to 2 V | 10 Hz to 20 Hz | 250 μV/V + 12 μV | |
| | | 20 Hz to 40 Hz | 100 μV/V + 7.1 μV | |
| | | 40 Hz to 20 kHz | 90 μV/V + 7.1 μV | |
| | | 20 kHz to 50 kHz | 210 μV/V + 7.4 μV | |
| | | 50 kHz to 100 kHz | 470 μV/V + 18 μV | |
| | | 100 kHz to 300 kHz | 920 μV/V + 56 μV | |
| 300 kHz to 500 kHz | | 0.14 % + 200 μV | | |
| 500 kHz to 1 MHz | | 0.28 % + 200 μV | | |
| 2 V to 20 V | 10 Hz to 20 Hz | 250 μV/V + 46 μV | | |
| | 20 Hz to 40 Hz | 94 μV/V + 26 μV | | |
| | 40 Hz to 20 kHz | 47 μV/V + 20 μV | | |
| | 20 kHz to 50 kHz | 77 μV/V + 43 μV | | |
| | 50 kHz to 100 kHz | 110 μV/V + 69 μV | | |
| | 100 kHz to 300 kHz | 430 μV/V + 100 μV | | |
| | 300 kHz to 500 kHz | 0.10 % + 210 μV | | |
| | 500 kHz to 1 MHz | 0.17 % + 310 μV | | |

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| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks | |
|--|-------------------|-----------------------------|--|---------|---------------------------------|
| AC Voltage – Measure and measuring equipment | 20 V to 200 V | 100 kHz to 300 kHz | 280 μ V/V + 610 μ V | | |
| | | 300 kHz to 500 kHz | 0.10 % + 2 mV | | |
| | | 500 kHz to 1 MHz | 0.15 % + 3.3 mV | | |
| | 200 V to 750 V | 10 Hz to 20 Hz | 250 μ V/V + 4.5 mV | | |
| | | 20 Hz to 40 Hz | 95 μ V/V + 2.6 mV | | |
| | | 40 Hz to 20 kHz | 55 μ V/V + 1.6 mV | | |
| | | 20 kHz to 50 kHz | 82 μ V/V + 1.8 mV | | |
| | | 50 kHz to 100 kHz | 150 μ V/V + 2.9 mV | | |
| | 200 V to 1,100 V | 30 kHz to 50 kHz | 610 μ V/V + 23 mV | | Fluke 5720A w/5725A |
| | | 50 kHz to 100 kHz | 0.23 % + 47 mV | | |
| | | 40 Hz to 1 kHz | 98 μ V/V + 4.1 mV | | |
| | 0 mV to 200 mV | 1 kHz to 20 kHz | 170 μ V/V + 16 mV | | Fluke 8508A w/voltage source |
| | | 20 kHz to 30 kHz | 610 μ V/V + 59 mV | | |
| | | 1 Hz to 10 Hz | 170 μ V/V + 14 μ V | | |
| | | 10 Hz to 40 Hz | 140 μ V/V + 4.2 μ V | | |
| | | 40 Hz to 100 Hz | 120 μ V/V + 4.2 μ V | | |
| 100 Hz to 2 kHz | | 110 μ V/V + 2.2 μ V | | | |
| 200 mV to 2 V | 2 kHz to 10 kHz | 110 μ V/V + 4.2 μ V | | | |
| | 10 kHz to 30 kHz | 320 μ V/V + 8.2 μ V | | | |
| | 30 kHz to 100 kHz | 720 μ V/V + 20 μ V | | | |
| | 1 Hz to 10 Hz | 160 μ V/V + 120 μ V | | | |
| | 10 Hz to 40 Hz | 120 μ V/V + 28 μ V | | | |
| | 40 Hz to 100 Hz | 93 μ V/V + 28 μ V | | | |
| | 100 Hz to 2 kHz | 80 μ V/V + 28 μ V | | | |
| | 2 kHz to 10 kHz | 110 μ V/V + 28 μ V | | | |
| | 10 kHz to 30 kHz | 230 μ V/V + 45 μ V | | | |
| | 30 kHz to 100 kHz | 600 μ V/V + 200 μ V | | | |
| 100 kHz to 300 kHz | 0.30 % + 2 mV | | | | |
| 300 kHz to 1 MHz | 1.0 % + 20 mV | | | | |

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| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks | |
|---|-----------------|---------------------------|--|---------|-------------------------------------|
| | 2 V to 20 V | 1 Hz to 10 Hz | 160 $\mu\text{V}/\text{V}$ + 220 μV | | |
| | | 10 Hz to 40 Hz | 120 $\mu\text{V}/\text{V}$ + 120 μV | | |
| | | 40 Hz to 100 Hz | 96 $\mu\text{V}/\text{V}$ + 83 μV | | |
| | | 100 Hz to 2 kHz | 82 $\mu\text{V}/\text{V}$ + 83 μV | | |
| | | 2 kHz to 10 kHz | 120 $\mu\text{V}/\text{V}$ + 120 μV | | |
| | | 10 kHz to 30 kHz | 220 $\mu\text{V}/\text{V}$ + 130 μV | | |
| | | 30 kHz to 100 kHz | 580 $\mu\text{V}/\text{V}$ + 260 μV | | |
| | | 100 kHz to 300 kHz | 0.30 % + 2 mV | | |
| | | 300 kHz to 1 MHz | 1.0 % + 20 mV | | |
| | 20 V to 200 V | 1 Hz to 10 Hz | 160 $\mu\text{V}/\text{V}$ + 1.1 mV | | |
| | | 10 Hz to 40 Hz | 120 $\mu\text{V}/\text{V}$ + 0.71 mV | | |
| | | 40 Hz to 100 Hz | 100 $\mu\text{V}/\text{V}$ + 2 mV | | |
| | | 100 Hz to 2 kHz | 86 $\mu\text{V}/\text{V}$ + 1.2 mV | | |
| | | 2 kHz to 10 kHz | 120 $\mu\text{V}/\text{V}$ + 1.2 mV | | |
| | | 10 kHz to 30 kHz | 230 $\mu\text{V}/\text{V}$ + 1.5 mV | | |
| | | 30 kHz to 100 kHz | 590 $\mu\text{V}/\text{V}$ + 11 mV | | |
| | 200 V to 1050 V | 40 Hz to 10 kHz | 120 $\mu\text{V}/\text{V}$ + 31 mV | | |
| | | 10 kHz to 30 kHz | 250 $\mu\text{V}/\text{V}$ + 47 mV | | |
| | | 30 kHz to 100 kHz | 670 $\mu\text{V}/\text{V}$ + 200 mV | | |
| | 0 mV to 10 mV | 100 kHz to 300 kHz | 1.4 % + 11 μV | | HP 3458A opt 02 w/voltage source |
| | | 300 kHz to 1 MHz | 1.4 % + 9.9 μV | | |
| | | 1 MHz to 4 MHz | 8.2 % + 11 μV | | |
| | 10 mV to 100 mV | 100 kHz to 300 kHz | 0.35 % + 17 μV | | |
| | | 300 kHz to 1 MHz | 1.3 % + 14 μV | | |
| | | 1 MHz to 4 MHz | 1.8 % + 13 μV | | |
| | | 4 MHz to 8 MHz | 4.7 % + 94 μV | | |
| | | 8 MHz to 10 MHz | 18 % + 270 μV | | |
| | 100 mV to 1 V | 100 kHz to 300 kHz | 0.35 % + 140 μV | | |
| 300 kHz to 1 MHz | | 1.2 % + 130 μV | | | |
| 1 MHz to 2 MHz | | 1.8 % + 120 μV | | | |
| 2 MHz to 4 MHz | | 4.7 % + 820 μV | | | |

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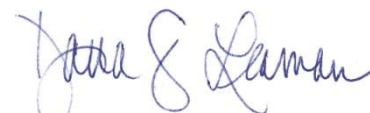
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| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks |
|---|--|---|---|----------------------------|
| | 1 V to 10 V | 4 MHz to 8 MHz 8 MHz to 10 MHz 100 kHz to 300 kHz 300 kHz to 1 MHz 1 MHz to 2 MHz 2 MHz to 4 MHz 4 MHz to 8 MHz 8 MHz to 10 MHz | 4.7 % + 940 μV 18 % + 2.5 mV 0.35 % + 1.2 mV 1.2 % + 1.2 mV 1.8 % + 1.2 mV 4.8 % + 8.2 mV 4.8 % + 9.4 mV 18 % + 14 mV | |
| LF CAPACITANCE (20/E10) | | | | |
| Capacitance – Source | 220 pF to 400 pF 0.4 nF to 1.1 nF 1.1 nF to 3.3 nF 3.3 nF to 11 nF 11 nF to 33 nF 33 nF to 110 nF 110 nF to 330 nF 0.33 μF to 1.1 μF 1.1 μF to 3.3 μF 3.3 μF to 11 μF 11 μF to 33 μF 33 μF to 110 μF 110 μF to 330 μF 0.33 mF to 1.1 mF 1.1 mF to 3.3 mF 3.3 mF to 11 mF 11 mF to 33 mF 33 mF to 110 mF | 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 600 kHz 10 Hz to 300 kHz 10 Hz to 150 kHz 10 Hz to 120 kHz 10 Hz to 80 kHz 0 Hz to 50 Hz DC DC DC DC DC | 0.04 % + 10 pF 0.24 % + 0.01 nF 0.34 % + 0.01 nF 0.21 % + 0.01 nF 0.12 % + 0.1 nF 0.18 % + 0.1 nF 0.18 % + 0.3 nF 0.18 % + 0.001 μF 0.18 % + 0.003 μF 0.19 % + 0.010 μF 0.30 % + 0.01 μF 0.34 % + 0.10 μF 0.34 % + 0.30 μF 034 % + 0.001 mF 0.33 % + 0.003 mF 0.33 % + 0.010 mF 0.56 % + 0.030 mF 0.86 % + 0.10 mF | Fluke 5522A |
| Capacitance – Measure and measuring equipment | 0.22 pF to 1 nF 1 nF to 10 nF 10 nF to 100 nF 0.1 μF to 1 μF 1 μF to 10 μF 10 μF to 100 μF | 10 Hz to 200 Hz 10 Hz to 200 Hz 10 Hz to 200 Hz 10 Hz to 200 Hz 10 Hz to 100 Hz 10 Hz to 80 Hz | 2 % + 0.02 nF 0.84 % + 0.039 nF 0.81 % + 0.39 nF 0.84 % + 0.0039 μF 0.84 % + 0.039 μF 0.92 % + 0.39 μF | Fluke 8846A w/capacitor |

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| Measured Parameter or Device Calibrated | Range | Frequency Range | Expanded Uncertainty ^{Note 3} | Remarks |
|--|---|---|--|-------------|
| | 0.1 mF to 1 mF 1 mF to 10 mF 10 mF to 100 mF | 10 Hz to 50 Hz DC DC | 0.91 % + 0.0039 mF 0.90 % + 0.039 mF 3.3 % + 0.19 mF | |
| LF POWER/ENERGY (20/E12) | | | | |
| DC Power – measuring equipment | 11 μW to 300 W 110 mW to 3 kW 1 W to 20.5 kW | 330 μA to 330 mA 330 mA to 3 A 3 A to 20.5 A | 0.02 % 0.02 % 0.06 % | Fluke 5522A |
| AC Power – measuring equipment 0 to 330 mV (PF = 1, Φ = 0°) ^{Note 7} | 30 mW to 110 mW 110 mW to 300 mW 300 mW to 730 mW 0.73 W to 1.5 W 1.5 W to 6.5 W | 45 Hz to 65 Hz | 0.09 % 0.11 % 0.10 % 0.11 % 0.08 % | Fluke 5522A |
| 330 mV to 1020 V (PF = 1, Φ = 0°) ^{Note 7} | 0.11 W to 9 W 9 W to 33 W 33 W to 92 W 92 W to 340 W 340 W to 920 W 920 W to 2.2 kW 2.2 kW to 4.6 kW 4.6 kW to 20.9 kW | 45 Hz to 65 Hz | 0.10 % 0.064 % 0.11 % 0.08 % 0.10 % 0.09 % 0.11 % 0.092 % | |
| PHASE METERS (20/E15) | | | | |
| Measuring and measuring equipment | 0° to 180° | 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 | 0.08° 0.20° 0.39° 2.0° 3.9° 7.9° | Fluke 5522A |

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Notes 3,5} | Remarks |
|---|---------------------|---|--------------------------|
| TIME & FREQUENCY | | | |
| FREQUENCY DISSEMINATION (20/F01) | | | |
| Frequency-Measuring equipment and measure | 1 mHz to 225 MHz | 0.021 μ Hz/Hz | Rubidium clock w/counter |
| STOPWATCHES & TIMERS (20/F05) | | | |
| Time – Measure | Up to 300 sec/month | 0.066 sec/day | Timometer |

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Notes 3,5} | Remarks |
|---|--------|---|------------|
| MECHANICAL | | | |
| MASS DETERMINATION (20/M08) | | | |
| Metric | 30 kg | 5.8 mg | Echelon II |
| | 25 kg | 4.9 mg | |
| | 20 kg | 4.4 mg | |
| | 10 kg | 1.6 mg | |
| | 5 kg | 0.79 mg | |
| | 2 kg | 0.34 mg | |
| | 1 kg | 0.20 mg | |
| | 500 g | 79 μ g | |
| | 200 g | 37 μ g | |
| | 100 g | 19 μ g | |
| | 50 g | 12 μ g | |
| | 20 g | 9.4 μ g | |
| | 10 g | 7.6 μ g | |
| | 5 g | 6.3 μ g | |
| | 2 g | 5.7 μ g | |
| | 1 g | 3.2 μ g | |
| | 500 mg | 2.8 μ g | |
| | 200 mg | 2.2 μ g | |
| | 100 mg | 1.7 μ g | |
| | 50 mg | 1.4 μ g | |
| | 20 mg | 1.3 μ g | |
| | 10 mg | 1.1 μ g | |

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Notes 3,5} | Remarks |
|--|---|--|--|
| | 5 mg 2 mg 1 mg | 0.9 µg 0.9 µg 0.9 µg | |
| THERMODYNAMIC | | | |
| HUMIDITY (20/T02) | | | |
| Humidity – Generate (0 °C to 35 °C) (35 °C to 50 °C) (35 °C to 50 °C) | 10 % RH to 95 % RH 10 % RH to 74 % RH 74 % RH to 95 % RH | 0.5 % RH 0.5 % RH 0.6 % RH | Thunder Scientific 2500 |
| LABORATORY THERMOMETERS (20/T03) | | | |
| Temperature Measure Field calibrations available ^{Note 4} | -196 °C -95 °C to 0 °C >0 °C to 100 °C >100 °C to 400 °C | 0.043 °C 0.030 °C 0.033 °C 0.056 °C | LN2 9190A 9173 9173 |
| Temperature – Source and Measurement | >400 °C to 1200 °C | 2.0 °C | Furnace with Type S Thermocouple |
| Temperature – Source | 0 °C to 70 °C | 0.00069 °C/°C + 0.036 °C | Thunder Scientific 2500 |
| Isothermal junction | 0 °C to 30 °C | 0.020 °C | Thermocouple half junction |
| Temperature Measure | >400 °C to 1200 °C | 1.7 °C | Type S Thermocouple |
| PRESSURE (20/T05) | | | |
| Barometric Pressure (Pneumatic) – Generate & Measure | 70 kPa to 110 kPa | 98 mPa/kPa + 0.23 Pa | Fluke RPM4 A200Kp/BA100Ks (Measure only) |
| Differential Pressure (Pneumatic) – Generate & Measure | 0 kPa to 15 kPa | 36 mPa/kPa + 9.5 mPa | DHI FPG 8601 |

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Notes 3,5} | Remarks |
|--|--|--|---|
| Absolute Pressure (Pneumatic) – Generate & Measure | 0 kPa to 15 kPa | 44 mPa/kPa + 12 mPa | DHI FPG 8601 |
| | 14 kPa to 700 kPa | 13 mPa/kPa + 0.24 Pa | DHI PG7601 w/20 kPa/kg piston |
| Gage Pressure (Pneumatic) – Generate & Measure | 140 kPa to 7000 kPa | 20 mPa/kPa + 1.2 mPa | DHI PG7601 w/200 kPa/kg piston |
| | 0 kPa to 15 kPa | 32 mPa/kPa + 7.1 mPa | DHI FPG 8601 |
| | 14 kPa to 700 kPa -100.0 kPa to 0 kPa | 15 mPa/kPa + 0.13 mPa 15 mPa/kPa + 0.13 mPa | DHI PG7601 with 20 kPa/kg piston |
| | 140 kPa to 7000 kPa | 21 mPa/kPa + 1.2 Pa | DHI PG7601 with 200 kPa/kg piston |
| RESISTANCE THERMOMETRY (20/T07) | | | |
| SPRT calibration by Fixed Point Cells | -189.3442 °C | 2.9 mK | Argon Triple Point Cell (ArTP) |
| | -38.8344 °C | 1.7 mK | Mercury Triple Point Cell (HgTP) |
| | 0.010 °C | 0.70 mK | Water Triple Point Cell (H ₂ O TP) |
| | 29.7646 °C | 1.5 mK | Gallium Melting Point Cell (GaMP) |
| | 156.5985 °C | 1.6 mK | Indium Freezing Point Cell (InFP) |
| | 231.928 °C | 1.7 mK | Tin Freezing Point Cell (SnFP) |
| | 419.527 °C | 2.1 mK | Zinc Freezing Point Cell (ZnFP) |
| | 660.323 °C | 4.2 mK | Aluminum Freezing Point Cell (AlFP) |

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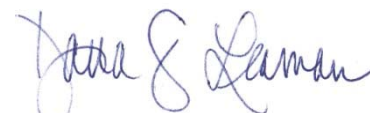
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Notes 3,5} | Remarks |
|--|---|---|----------------------|
| High Quality PRT calibration by comparison to SPRT | -196 °C -80 °C to 0 °C 0.01 °C >0.1 °C to 30 °C >30 °C to 157 °C >157 °C to 232 °C >232 °C to 420 °C >420 °C to 660 °C | 4.4 mK 2.8 mK 1.7 mK 3.3 mK 4.1 mK 4.9 mK 7.1 mK 11 mK | Super-thermometer II |
| PRT calibration by comparison to high quality PRT | -196 °C -85 °C to 0 °C 0 °C >0.1 °C to 30 °C >30 °C to 157 °C >157 °C to 232 °C >232 °C to 420 °C >420 °C to 660 °C | 5.5 mK 3.6 mK 3.0 mK 4.2 mK 5.5 mK 7.0 mK 12 mK 28 mK | Super-thermometer II |
| TEMPERATURE INDICATORS (20/T08) | | | |
| Thermocouple Simulation | | | Fluke 5522A |
| Type B | 600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1550 °C 1550 °C to 1820 °C | 0.40 °C 0.35 °C 0.32 °C 0.30 °C | |
| Type C | 0 °C to 150 °C 150 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1800 °C 1800 °C to 2316 °C | 0.21 °C 0.18 °C 0.22 °C 0.32 °C 0.50 °C | |
| Type E | -250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C | 0.10 °C 0.10 °C 0.084 °C 0.098 °C 0.13 °C | |

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Notes 3,5} | Remarks |
|---|--------------------|---|---------|
| Type J | -210 °C to -100 °C | 0.16 °C | |
| | -100 °C to -30 °C | 0.10 °C | |
| | -30 °C to 150 °C | 0.086 °C | |
| | 150 °C to 760 °C | 0.11 °C | |
| | 760 °C to 1200 °C | 0.15 °C | |
| Type K | -210 °C to -100 °C | 0.20 °C | |
| | -100 °C to -25 °C | 0.12 °C | |
| | -25 °C to 120 °C | 0.10 °C | |
| | 120 °C to 1000 °C | 0.16 °C | |
| | 1000 °C to 1372 °C | 0.24 °C | |
| Type L (J DIN) | -200 °C to -100 °C | 0.30 °C | |
| | -100 °C to 800 °C | 0.22 °C | |
| Type N | -200 °C to -100 °C | 0.25 °C | |
| | -100 °C to -25 °C | 0.15 °C | |
| | -25 °C to 120 °C | 0.13 °C | |
| | 120 °C to 410 °C | 0.12 °C | |
| | 410 °C to 1300 °C | 0.18 °C | |
| Type R | 0 °C to 250 °C | 0.42 °C | |
| | 250 °C to 400 °C | 0.28 °C | |
| | 400 °C to 1000 °C | 0.25 °C | |
| | 1000 °C to 1767 °C | 0.27 °C | |
| Type S | 0 °C to 250 °C | 0.42 °C | |
| | 250 °C to 1000 °C | 0.28 °C | |
| | 1000 °C to 1400 °C | 0.27 °C | |
| | 1400 °C to 1767 °C | 0.31 °C | |

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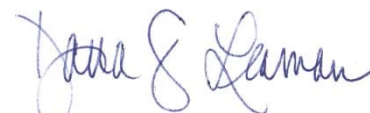
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

| Measured Parameter or Device Calibrated | Range | Expanded Uncertainty ^{Notes 3,5} | Remarks |
|---|--------------------|---|---------|
| Type T | -250 °C to -150 °C | 0.38 °C | |
| | -150 °C to 0 °C | 0.15 °C | |
| | 0 °C to 120 °C | 0.10 °C | |
| | 120 °C to 400 °C | 0.10 °C | |
| Type U (T DIN) | -200 °C to 0 °C | 0.44 °C | |
| | 0 °C to 600 °C | 0.22 °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 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.5 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.)

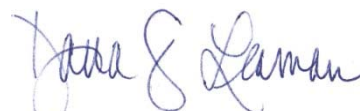
Note 5: Values listed with percent (%) are percent of reading or generated value unless otherwise noted.

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: Laboratory can generate power at a different PF than 1. Uncertainty will increase as power factor reduces from 1 to 0. The increase will not be linear with very little change down to 0.8 PF and increasing rapidly from 0.2 PF down to zero. Contact lab for more information.

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