

**CALIBRATION LABORATORIES**

**NVLAP LAB CODE 200958-0**

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

|                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                     |
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| <b>J&amp;J Calibration Service Inc.</b><br>460 Main Avenue<br>P.O. Box 63<br>Walcott, ND 58077-0063<br>Mr. Jeremy Alm<br>Phone: 701-469-2340 Fax: 701-469-2342<br>E-mail: <a href="mailto:jeremy.alm@jjcalibration.com">jeremy.alm@jjcalibration.com</a><br>URL: <a href="http://www.jjcalibration.com">www.jjcalibration.com</a> | <b>Fields of Calibration</b><br>Dimensional<br>DC/ Low Frequency<br>Time & Frequency<br>Mechanical<br>Thermodynamics<br><br>This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (20/A01) |
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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)** <sup>Notes 1,2</sup>

| Measured Parameter or<br>Device Calibrated                                                                                             | Range                          | Expanded<br>Uncertainty <sup>Notes 3,5</sup> | Remarks                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------|----------------------------------------------------------------------------|
| <b>DIMENSIONAL</b>                                                                                                                     |                                |                                              |                                                                            |
| <b>LENGTH &amp; DIAMETER; STEP GAGES (20/D05)</b>                                                                                      |                                |                                              |                                                                            |
| Gage Blocks - Croblox or steel                                                                                                         | 0.050 in to 1.0 in             | 4 µin                                        | Comparison to master gage Blocks using comparator stand and gage amplifier |
|                                                                                                                                        | 2.0 in to 4.0 in               | 2 µin + 1.5 µin/in                           |                                                                            |
| Long blocks - steel                                                                                                                    | 5.0 in to 10.0 in              | 2.5 µin + 1.5 µin/in                         | Comparison to master gage Blocks using universal measuring machine         |
|                                                                                                                                        | >10.0 in to 20.0 in            | 2.8 µin + 1.6 µin/in                         |                                                                            |
| Micrometers, Outside, Inside, Depth<br>Field calibrations available <sup>Note 4</sup><br>Mobile laboratory available <sup>Note 7</sup> | Up to 2 in<br>>2 in to 36 in   | 40 µin + 0.6R<br>40 µin + 3 µin/in + 0.6R    | Comparison to gage blocks                                                  |
| Calipers<br>Field calibrations available <sup>Note 4</sup><br>Mobile laboratory available <sup>Note 7</sup>                            | 0 in to 6 in<br>>6 in to 60 in | 81 µin + 0.6R<br>81 µin + 7.9 µin/in + 0.6R  | Comparison to gage blocks                                                  |
| Indicators<br>Field calibrations available <sup>Note 4</sup><br>Mobile laboratory available <sup>Note 7</sup>                          | 0 in to 4 in                   | 7.6 µin + 0.6R                               | Comparison to gage blocks                                                  |

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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)** Notes 1,2

| <b>Measured Parameter or Device Calibrated</b>                                                                  | <b>Range</b>          | <b>Expanded Uncertainty</b> Notes 3,5 | <b>Remarks</b>                              |
|-----------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------|---------------------------------------------|
| Height Gages<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7                       | 0 in to 40 in         | 160 $\mu$ in + 1.7 $\mu$ in/in + 0.6R | Comparison to gage blocks                   |
| Single Axis, Inner Dimension<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7       | 0.10 in to 10 in      | 6.2 $\mu$ in + 1.8 $\mu$ in/in        | Ring comparator and gage blocks             |
| Single Axis, Outer Dimension<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7       | Up to 10 in           | 13 $\mu$ in + 1.5 $\mu$ in/in         | Super Micrometer and gage blocks            |
| Primary Lab only                                                                                                | < 1 in                | 5.1 $\mu$ in                          | Universal measuring machine and gage blocks |
| <b>MEASURING WIRES (20/D07)</b>                                                                                 |                       |                                       |                                             |
| Thread Wire Sets<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7                   | 4 TPI to 80 TPI       | 19 $\mu$ in                           | Gage blocks and Super Micrometer            |
| <b>SURFACE TEXTURE (20/D12)</b>                                                                                 |                       |                                       |                                             |
| Surface Plates<br>Field calibrations available Note 4                                                           |                       |                                       |                                             |
| Flatness, overall                                                                                               | Up to 225 in on diag. | 45 $\mu$ in                           | Digital levels                              |
| Flatness, local area                                                                                            | Up to 12 in on diag.  | 32 $\mu$ in                           | Datum gage<br>(Repeat-o-meter)              |
| <b>THREADED PLUG &amp; RING GAGES (20/D14)</b>                                                                  |                       |                                       |                                             |
| Thread Ring Gages - pitch diameter<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7 | > 0 in to 9 in        | 4.7 x 10 <sup>-4</sup> in             | Setting plug gages                          |
| Thread Plug Gages - pitch diameter<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7 | > 0 in to 9 in        | 33 $\mu$ in                           | Super Micrometer and thread wires           |

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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)** Notes 1,2

| Measured Parameter or Device Calibrated                                                                                          | Range                     | Frequency Range | Expanded Uncertainty <small>Notes 3,5</small> | Remarks          |
|----------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------|-----------------------------------------------|------------------|
| <b>ELECTROMAGNETICS – DC/LOW FREQUENCY</b>                                                                                       |                           |                 |                                               |                  |
| <b>AC CURRENT (20/E02)</b>                                                                                                       |                           |                 |                                               |                  |
| AC Current - Generate<br>Field calibrations available <small>Note 4</small><br>Mobile laboratory available <small>Note 7</small> | 20 $\mu$ A to 202 $\mu$ A | 10 Hz to 44 Hz  | 0.27 % + 0.25 $\mu$ A                         | Transmille 3010A |
|                                                                                                                                  |                           | 45 Hz to 999 Hz | 0.085 % + 0.15 $\mu$ A                        |                  |
|                                                                                                                                  |                           | 1 kHz to 10 kHz | 0.94 % + 0.25 $\mu$ A                         |                  |
|                                                                                                                                  | 200 $\mu$ A to 2.02 mA    | 10 Hz to 44 Hz  | 0.27 % + 0.25 $\mu$ A                         |                  |
|                                                                                                                                  |                           | 45 Hz to 999 Hz | 0.073 % + 0.20 $\mu$ A                        |                  |
|                                                                                                                                  |                           | 1 kHz to 10 kHz | 0.59 % + 0.30 $\mu$ A                         |                  |
|                                                                                                                                  | 2 mA to 20.2 mA           | 10 Hz to 44 Hz  | 0.27 % + 3.0 $\mu$ A                          |                  |
|                                                                                                                                  |                           | 45 Hz to 999 Hz | 0.048 % + 2.0 $\mu$ A                         |                  |
|                                                                                                                                  |                           | 1 kHz to 10 kHz | 0.31 % + 3.0 $\mu$ A                          |                  |
|                                                                                                                                  | 20 mA to 202 mA           | 10 Hz to 44 Hz  | 0.27 % + 30 $\mu$ A                           |                  |
|                                                                                                                                  |                           | 45 Hz to 999 Hz | 0.051 % + 20 $\mu$ A                          |                  |
|                                                                                                                                  |                           | 1 kHz to 10 kHz | 0.59 % + 40 $\mu$ A                           |                  |
| AC Current - Measure<br>Field calibrations available <small>Note 4</small><br>Mobile laboratory available <small>Note 7</small>  | 1 $\mu$ A to 100 $\mu$ A  | 10 Hz to 40 Hz  | 0.27 % + 300 $\mu$ A                          | Transmille 8081  |
|                                                                                                                                  |                           |                 | 0.074 % + 200 $\mu$ A                         |                  |
|                                                                                                                                  |                           |                 | 0.59 % + 400 $\mu$ A                          |                  |
|                                                                                                                                  |                           | 41 Hz to 1 kHz  | 0.27 % + 3.0 mA                               |                  |
|                                                                                                                                  |                           |                 | 0.10 % + 2.0 mA                               |                  |
|                                                                                                                                  |                           | 100 Hz to 1 kHz | 0.35 % + 4.0 mA                               |                  |
|                                                                                                                                  |                           | 1 kHz to 10 kHz | 0.11 % + 15 nA                                |                  |
|                                                                                                                                  |                           |                 | 0.062 % + 12 nA                               |                  |
|                                                                                                                                  |                           | 1 kHz to 10 kHz | 0.15 % + 30 nA                                |                  |
|                                                                                                                                  |                           |                 |                                               |                  |

*John S. Laman*

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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2**

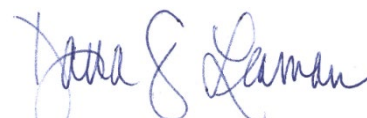
| Measured Parameter or Device Calibrated | Range               | Frequency Range | Expanded Uncertainty Notes 3,5 | Remarks |
|-----------------------------------------|---------------------|-----------------|--------------------------------|---------|
|                                         | 101 mA to 1 A       | 10 Hz to 40 Hz  | 0.11 % + 0.15 $\mu$ A          |         |
|                                         |                     | 41 Hz to 1 kHz  | 0.061 % + 0.12 $\mu$ A         |         |
|                                         |                     | 1 kHz to 10 kHz | 0.15 % + 0.30 $\mu$ A          |         |
|                                         | 1.001 mA to 10 mA   | 10 Hz to 40 Hz  | 0.11 % + 1.5 $\mu$ A           |         |
|                                         |                     | 41 Hz to 1 kHz  | 0.074 % + 1.2 $\mu$ A          |         |
|                                         |                     | 1 kHz to 10 KHz | 0.15 % + 3.0 $\mu$ A           |         |
|                                         | 10.001 mA to 100 mA | 10 Hz to 40 Hz  | 0.12 % + 0.15 $\mu$ A          |         |
|                                         |                     | 41 Hz to 1 kHz  | 0.062 % + 12 $\mu$ A           |         |
|                                         |                     | 1 kHz to 10 KHz | 0.15 % + 30 $\mu$ A            |         |
|                                         | 101 mA to 1A        | 10 Hz to 40 Hz  | 0.14 % + 0.20 mA               |         |
|                                         |                     | 41 Hz to 1 kHz  | 0.084 % + 0.15 mA              |         |
|                                         |                     | 1 kHz to 10 KHz | 0.16 % + 0.50 mA               |         |
|                                         | 1.001 A to 10 A     | 10 Hz to 40 Hz  | 0.21 % + 4.0 mA                |         |
|                                         |                     | 41 Hz to 1 kHz  | 0.15 % + 3.0 mA                |         |
|                                         | 10.001 A to 30 A    | 10 Hz to 40 Hz  | 0.21 % + 12 mA                 |         |
|                                         |                     | 41 Hz to 1 kHz  | 0.15 % + 9.0 mA                |         |

**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2**

| Measured Parameter or Device Calibrated                                                            | Range                    | Expanded Uncertainty Notes 3,5 | Remarks          |
|----------------------------------------------------------------------------------------------------|--------------------------|--------------------------------|------------------|
| <b>DC RESISTANCE AND CURRENT (20/E05)</b>                                                          |                          |                                |                  |
| DC Current - Generate<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7 | 1 $\mu$ A to 202 $\mu$ A | 0.012 % + 10 nA                | Transmille 3010A |
|                                                                                                    | 202 $\mu$ A to 2.02 mA   | 61 $\mu$ A/A + 30 nA           |                  |
|                                                                                                    | 2.02 mA to 20.2 mA       | 61 $\mu$ A/A + 0.20 $\mu$ A    |                  |
|                                                                                                    | 20.2 mA to 202 mA        | 73 $\mu$ A/A + 2.0 $\mu$ A     |                  |
|                                                                                                    | 202 mA to 2.02 A         | 0.016 % + 30 $\mu$ A           |                  |
|                                                                                                    | 2.02 A to 20.2 A         | 0.035 % + 300 $\mu$ A          |                  |
|                                                                                                    | 20.2 A to 30 A           | 0.060 % + 450 $\mu$ A          |                  |

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| Measured Parameter or Device Calibrated                                                            | Range                                                                                                                                                                                          | Expanded Uncertainty Notes 3,5                                                                                                                                                                                                                                                                         | Remarks                                                                                                    |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| DC Current - Measure<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7  | 0.1 nA to 10 nA<br>10 nA to 100 nA<br>100 nA to 1 µA<br>1 µA to 10 µA<br>10 µA to 100 µA<br>100 µA to 1 mA<br>1 mA to 10 mA<br>10 mA to 100 mA<br>100 mA to 1 A<br>1 A to 10 A<br>10 A to 30 A | 2.3 % + 0.8 pA<br>0.39 % + 3.4 pA<br>0.042 % + 17 pA<br>61 µA/A + 100 pA<br>18 µA/A + 0.40 nA<br>18 µA/A + 4.0 nA<br>21 µA/A + 40 nA<br>55 µA/A + 0.60 µA<br>0.027 % + 13 µA<br>0.068 % + 350 µA<br>0.091 % + 15 mA                                                                                    | Transmille 8081                                                                                            |
| Resistance - Generate<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7 | 0 mΩ<br>100 mΩ<br>1 Ω<br>10 Ω<br>100 Ω<br>1 kΩ<br>10 kΩ<br>100 kΩ<br>1 MΩ<br>10 MΩ<br>100 MΩ<br>1 GΩ<br><br>1 MΩ<br>5 MΩ<br>10 MΩ<br>25 MΩ<br>100 MΩ<br>1 GΩ                                   | 5.9 mΩ<br>0.013 % + 0.005 Ω<br>0.015 % + 0.005 Ω<br>33 µΩ/Ω + 0.005 Ω<br>21 µΩ/Ω + 0.005 Ω<br>21 µΩ/Ω + 0.005 Ω<br>9.8 µΩ/Ω + 0.05 Ω<br>22 µΩ/Ω + 0.50 Ω<br>32 µΩ/Ω + 5 Ω<br>0.011 % + 100 Ω<br>0.21 % + 2.0 kΩ<br>1.2 % + 30 kΩ<br><br>0.066 %<br>0.066 %<br>0.066 %<br>0.067 %<br>0.068 %<br>0.085 % | Transmille 3010A<br><br><br><br><br><br><br><br><br><br><br><br><br>Ohmmite resistors with Transmille 8081 |

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| Measured Parameter or Device Calibrated                                                            | Range                                                                                                                                                                                                                                                                                                                                                                                                   | Expanded Uncertainty Notes 3,5                                                                                                                                                                                                                                                                                                                                           | Remarks          |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Resistance - Measure<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7  | 0.001 $\Omega$ to 1 $\Omega$<br>1.001 $\Omega$ to 10 $\Omega$<br>10.001 $\Omega$ to 100 $\Omega$<br>100.001 $\Omega$ to 1 k $\Omega$<br>1.001 $\Omega$ to 10 k $\Omega$<br>10.001 k $\Omega$ to 100 k $\Omega$<br>101 k $\Omega$ to 1 M $\Omega$<br>1.001 M $\Omega$ to 10 M $\Omega$<br>10.01 M $\Omega$ to 30 M $\Omega$<br>30.01 M $\Omega$ to 270 M $\Omega$<br>270.1 M $\Omega$ to 2700 M $\Omega$ | 29 $\mu\Omega/\Omega$ + 6.0 $\mu\Omega$<br>19 $\mu\Omega/\Omega$ + 30 $\mu\Omega$<br>17 $\mu\Omega/\Omega$ + 100 $\mu\Omega$<br>15 $\mu\Omega/\Omega$ + 800 m $\Omega$<br>17 $\mu\Omega/\Omega$ + 8.0 m $\Omega$<br>18 $\mu\Omega/\Omega$ + 800 $\Omega$<br>22 $\mu\Omega/\Omega$ + 2.0 $\Omega$<br>29 $\mu\Omega/\Omega$ + 80 $\Omega$<br>0.017 %<br>0.016 %<br>0.054 % | Transmille 8081  |
| <b>DC VOLTAGE (20/E06)</b>                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                          |                  |
| DC Voltage - Generate<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7 | 0 $\mu$ V to 202 mV<br>200 mV to 2.02 V<br>2 V to 20.2 V<br>20 V to 202 V<br>200 V to 1025 V                                                                                                                                                                                                                                                                                                            | 18 $\mu$ V/V + 2.0 $\mu$ V<br>11 $\mu$ V/V + 2.5 $\mu$ V<br>9.9 $\mu$ V/V + 24 $\mu$ V<br>14 $\mu$ V/V + 240 $\mu$ V<br>14 $\mu$ V/V + 2.4 mV                                                                                                                                                                                                                            | Transmille 3010A |
| DC Voltage - Measure<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7  | 0 nV to 100 mV<br>101 mV to 1 V<br>1.001 V to 10 V<br>10.001 V to 100 V<br>101 V to 1050 V                                                                                                                                                                                                                                                                                                              | 13 $\mu$ V/V + 0.17 $\mu$ V<br>7.9 $\mu$ V/V + 0.60 $\mu$ V<br>8.5 $\mu$ V/V + 6.0 $\mu$ V<br>11 $\mu$ V/V + 80 $\mu$ V<br>12 $\mu$ V/V + 1.2 mV                                                                                                                                                                                                                         | Transmille 8081  |

**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)** Notes 1,2

| Measured Parameter or Device Calibrated                                                               | Range          | Frequency Range                                          | Expanded Uncertainty Notes 3,5                                       | Remarks          |
|-------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------|----------------------------------------------------------------------|------------------|
| <b>LF AC VOLTAGE (20/E09)</b>                                                                         |                |                                                          |                                                                      |                  |
| LF AC Voltage – Generate<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7 | 0 mV to 202 mV | 10 Hz to 44 Hz<br>45 Hz to 999 Hz<br>1 kHz to 19.999 kHz | 0.098 % + 15 $\mu$ V<br>0.025 % + 15 $\mu$ V<br>0.033 % + 28 $\mu$ V | Transmille 3010A |

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| Measured Parameter or Device Calibrated                                                                                    | Range            | Frequency Range      | Expanded Uncertainty <sup>Notes 3,5</sup> | Remarks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| LF AC Voltage – Measure<br>Field calibrations available <sup>Note 4</sup><br>Mobile laboratory available <sup>Note 7</sup> | 200 mV to 2.02 V | 20 kHz to 99.999 kHz | 0.12 % + 40 μV                            | Limited frequency and voltage pairs for this voltage range<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br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2020-12-21 through 2021-12-31

Effective dates



For the National Voluntary Laboratory Accreditation Program

**CALIBRATION LABORATORIES**

**NVLAP LAB CODE 200958-0**

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

| Measured Parameter or Device Calibrated | Range             | Frequency Range   | Expanded Uncertainty <sup>Notes 3,5</sup> | Remarks |
|-----------------------------------------|-------------------|-------------------|-------------------------------------------|---------|
|                                         | 1.001 V to 10 V   | 20 kHz to 100 kHz | 0.14 % + 500 $\mu$ V                      |         |
|                                         |                   | 100 kHz to 1 MHz  | 2.2 % + 25 mV                             |         |
|                                         |                   | 40 Hz to 200 Hz   | 0.037 % + 0.6 mV                          |         |
|                                         |                   | 200 Hz to 2 kHz   | 0.031 % + 0.6 mV                          |         |
|                                         |                   | 2 kHz to 20 kHz   | 0.11 % + 1 mV                             |         |
|                                         |                   | 20 kHz to 100 kHz | 0.14 % + 5 mV                             |         |
|                                         | 10.001 V to 100 V | 10 Hz to 40Hz     | 0.098 % + 15 mV                           |         |
|                                         |                   | 40 Hz to 200Hz    | 0.044 % + 9 mV                            |         |
|                                         |                   | 200 Hz to 2kHz    | 0.044 % + 7 mV                            |         |
|                                         |                   | 2 kHz to 20 kHz   | 0.11 % + 10 mV                            |         |
|                                         |                   | 20 kHz to 50 kHz  | 0.17 % + 50 mV                            |         |
|                                         |                   | 40 Hz to 200 Hz   | 0.049 % + 90 mV                           |         |
|                                         | 101 V to 1 kV     | 200 Hz to 2 kHz   | 0.062 % + 70 mV                           |         |
|                                         |                   | 2 kHz to 20 kHz   | 0.093 % + 100 mV                          |         |
|                                         |                   |                   |                                           |         |

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

| Measured Parameter or Device Calibrated        | Range        | Expanded Uncertainty <sup>Notes 3,5</sup> | Remarks          |
|------------------------------------------------|--------------|-------------------------------------------|------------------|
| LF CAPACITANCE (20/E10)                        |              |                                           |                  |
| LF Capacitance - Generate                      | 10 nF        | 0.32 %                                    | Transmille 3010A |
| Field calibrations available <sup>Note 4</sup> | 20 nF        | 0.32 %                                    |                  |
| Mobile laboratory available <sup>Note 7</sup>  | 50 nF        | 0.30 %                                    |                  |
|                                                | 100 nF       | 0.30 %                                    |                  |
|                                                | 1 μF         | 0.47 %                                    |                  |
|                                                | 10 μF        | 0.71 %                                    |                  |
| LF INDUCTANCE (20/E11)                         |              |                                           |                  |
| LF Inductance - Generate                       | 1 mH to 10 H | 0.60 %                                    | Transmille 3010A |
| Field calibrations available <sup>Note 4</sup> |              |                                           |                  |
| Mobile laboratory available <sup>Note 7</sup>  |              |                                           |                  |

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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2**

| Measured Parameter or Device Calibrated                                                                  | Range                                                                                                                              | Expanded Uncertainty Notes 3,5                 | Remarks                                                       |
|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|
| <b>TIME AND FREQUENCY</b>                                                                                |                                                                                                                                    |                                                |                                                               |
| <b>FREQUENCY DISSEMINATION (20/F01)</b>                                                                  |                                                                                                                                    |                                                |                                                               |
| Frequency Measuring Devices<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7 | 1 Hz to 10 MHz                                                                                                                     | 1.2 $\mu$ Hz/Hz                                | Transmille 3010A                                              |
| Frequency Source Devices<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7    | 1 Hz to 1 MHz                                                                                                                      | 2.5 $\mu$ Hz/Hz + 2 digits                     | Transmille 8081                                               |
| <b>MECHANICAL</b>                                                                                        |                                                                                                                                    |                                                |                                                               |
| <b>TORQUE (20/M15)</b>                                                                                   |                                                                                                                                    |                                                |                                                               |
| Torque Tools<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7                | 4 lbf-in to 50 lbf-in<br>30 lbf-in to 400 lbf-in<br>80 lbf-in to 1000 lbf-in<br>20 lbf-ft to 250 lbf-ft<br>60 lbf-ft to 600 lbf-ft | 0.55 %<br>0.46 %<br>0.32 %<br>0.42 %<br>0.41 % | ASME B107.14-2004,<br>ISO 6789:2003, using torque transducers |
| Torque Transducers<br>Field calibrations available Note 4<br>Mobile laboratory available Note 7          | 4 lbf-in to 50 lbf-in<br>30 lbf-in to 400 lbf-in<br>80 lbf-in to 1000 lbf-in<br>20 lbf-ft to 250 lbf-ft<br>60 lbf-ft to 600 lbf-ft | 0.20 %<br>0.20 %<br>0.20 %<br>0.20 %<br>0.20 % | ASME B107.29-2005 using torque arm and weights                |
| <b>THERMODYNAMIC</b>                                                                                     |                                                                                                                                    |                                                |                                                               |
| <b>RESISTANCE THERMOMETRY (20/T07)</b>                                                                   |                                                                                                                                    |                                                |                                                               |
| Temperature Source Devices<br>(baths, calibrators)                                                       | -80 °C to 420 °C                                                                                                                   | 0.22 °C                                        | SPRT temperature probe and Transmille 8081                    |
| Temperature Measuring Devices<br>(thermometers, probes)                                                  | 0 °C to 230 °C<br>>230 °C to 420 °C                                                                                                | 0.032 °C + 0.6R<br>0.053 °C + 0.6R             | SPRT temperature probe,<br>Transmille 8081 w/temp bath        |

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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)** Notes 1,2

| Measured Parameter or Device Calibrated | Range                   | Expanded Uncertainty <sup>Notes 3,5</sup> | Remarks                                 |
|-----------------------------------------|-------------------------|-------------------------------------------|-----------------------------------------|
| PRESSURE (20/T05)                       |                         |                                           |                                         |
| Pressure – hydraulic measuring devices  | 10 psig to 500 psig     | 0.019 %                                   | ASME B40.1-1991 using deadweight tester |
|                                         | 200 psig to 10 000 psig | 0.018 %                                   |                                         |
| END                                     |                         |                                           |                                         |

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**CALIBRATION LABORATORIES**

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| Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Note 1:</b> 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.</p> <p><b>Note 2:</b> 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.</p> <p><b>Note 3:</b> 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 <math>k = 2</math>. However, laboratories may report a coverage factor different than <math>k = 2</math> 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).</p> <p><b>Note 3a:</b> 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.</p> <p><b>Note 3b:</b> 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.</p> <p><b>Note 3c:</b> As described in Note 1, CMCs cover calibrations and measurements that are available to the laboratory's customers under <i>normal conditions</i>. 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.</p> <p><b>Note 4:</b> 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.)</p> <p><b>Note 5:</b> Values listed with percent (%) are percent of reading or generated value unless otherwise noted.</p> <p><b>Note 6:</b> NVLAP accreditation is the formal recognition of specific calibration capabilities. Neither NVLAP nor NIST guarantee the accuracy of individual calibrations made by accredited laboratories.</p> <p><b>Note 7:</b> The laboratory utilizes a mobile lab for most of its field service work. Please note that uncertainties listed are valid whenever the work is performed in the mobile lab. If work is done in customer facility, then note 4 will apply.</p> |

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