



**CALIBRATION LABORATORIES**

**NVLAP LAB CODE 200816-0**

**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005**

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| <p><b>L-3 Cincinnati Electronics</b><br/>7500 Innovation Way<br/>Mason, OH 45040-9699<br/>Mr. Steven Davis<br/>Phone: 513-573-6809 Fax: 513-573-6499<br/>E-mail: steven.davis@L-3com.com<br/>URL: http://www.L-3com.com/CE</p> | <p><b>Parameter(s) of Accreditation</b><br/>Dimensional<br/>Electromagnetics – DC/Low Frequency<br/>Mechanical<br/>Electromagnetics – RF/Microwave<br/>Thermodynamic</p> |
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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)<sup>Notes 1,2</sup>**

| Measured Parameter or Device Calibrated  | Range   | Uncertainty ( $k=2$ ) <sup>Note 3</sup>   | Remarks  |
|--|---|---|----------|
| <b>DIMENSIONAL</b>   |   |   |          |
| <b>NVLAP Code: 20/D05<br/>LENGTH</b><br>Calipers                                   | 0 in to 6 in  | 0.00029 in  |          |
| <b>ELECTROMAGNETICS – DC/LOW FREQUENCY</b>   |   |   |          |
| <b>NVLAP Code: 20/E02<br/>AC CURRENT</b><br>Over 10 Hz to 5 kHz<br>Frequency range | 0 A to 1 A<br>> 1 A to 3 A  | 180 $\mu$ A/A + 12 $\mu$ A<br>480 $\mu$ A/A + 0.17 mA   | 5700A/P2 |
| <b>NVLAP Code: 20/E05<br/>RESISTANCE</b>   | 0 $\Omega$ to 1 $\Omega$<br>> 1 $\Omega$ to 10 $\Omega$<br>> 10 $\Omega$ to 100 $\Omega$<br>> 100 $\Omega$ to 1 000 $\Omega$<br>> 1 k $\Omega$ to 10 k $\Omega$<br>> 10 k $\Omega$ to 100 k $\Omega$<br>> 100 k $\Omega$ to 1 M $\Omega$<br>> 1 M $\Omega$ to 10 M $\Omega$ | 5.6 m $\Omega$<br>20 m $\Omega$<br>1.4 m $\Omega$<br>2.1 m $\Omega$<br>21 m $\Omega$<br>0.21 $\Omega$<br>2.1 $\Omega$<br>100 $\Omega$ | 5700A/P2 |

2011-10-01 through 2012-09-30  
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**CALIBRATION AND MEASUREMENT CAPABILITIES (CMC)<sup>Notes 1,2</sup>**

| Measured Parameter or Device Calibrated | Range  | Uncertainty ( $k=2$ ) <sup>Note 3</sup>  | Remarks  |
|---|--|--|----------|
| DC Current                              | 0 mA to 10 mA<br>> 10 mA to 100 mA<br>> 100 mA to 1 A<br>> 1 A to 3 A                  | 60 $\mu$ A/A + 41 nA<br>72 $\mu$ A/A + 6.1 $\mu$ A<br>72 $\mu$ A/A + 2.1 $\mu$ A<br>96 $\mu$ A/A + 18 $\mu$ A                                    | 5700A/P2 |
| <b>NVLAP Code: 20/E06<br/>DC VOLTS</b>  | 0 V to 0.1 V<br>> 0.1 V to 1 V<br>> 1 V to 10 V<br>> 10 V to 100 V<br>> 100 V to 750 V | 8.4 $\mu$ V/V + 0.92 $\mu$ V<br>8.4 $\mu$ V/V + 2.1 $\mu$ V<br>6.0 $\mu$ V/V + 3.2 $\mu$ V<br>6.0 $\mu$ V/V + 0.63 mV<br>7.2 $\mu$ V/V + 0.64 mV | 5700A/P2 |

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

| Measured Parameter or Device Calibrated | Voltage Range  | Frequency Range  | Uncertainty ( $k=2$ ) <sup>Note 3</sup>   | Remarks  |
|---|--|--|---|----------|
| <b>NVLAP Code: 20/E09<br/>AC VOLTS</b>  | 0 V to 0.1 V<br>> 0.1 V to 1 V<br>> 0.1 V to 1 V<br>> 0.1 V to 1 V<br>> 1 V to 10 V<br>> 10 V to 100 V<br>> 100 V to 750 V | 10 Hz to 20 kHz<br>10 Hz to 20 kHz<br>> 20 kHz to 50 kHz<br>> 50 kHz to 300 kHz<br>10 Hz to 20 kHz<br>10 Hz to 20 kHz<br>10 Hz to 20 kHz | 130 $\mu$ V/V + 60 $\mu$ V<br>120 $\mu$ V/V + 8.5 $\mu$ V<br>150 $\mu$ V/V + 16 $\mu$ V<br>300 $\mu$ V/V + 49 $\mu$ V<br>90 $\mu$ V/V + 60 $\mu$ V<br>90 $\mu$ V/V + 0.6 mV<br>96 $\mu$ V/V + 10 mV | 5700A/P2 |

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

| Measured Parameter or Device Calibrated | Range   | Uncertainty ( $k=2$ ) <sup>Note 3</sup>  | Remarks      |
|---|---|--|--------------|
| <b>MECHANICAL</b>                       |   |  |              |
| <b>NVLAP Code: 20/M15<br/>TORQUE</b>    | 0.3 lbf-in to 3 lbf-in<br>> 3 lbf-in to 25 lbf-in | 5.0 %, but not less than 0.019 lbf-in<br>1.9 %, but not less than 0.086 lbf-in | Larson STWCS |

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| Measured Parameter or Device Calibrated | Range                      | Uncertainty ( $k=2$ ) <sup>Note 3</sup> | Remarks |
|---|----------------------------|---|---------|
|   | > 25 lbf-in to 100 lbf-in  | 2.4 %, but not less than 0.46 lbf-in    |         |
|   | > 100 lbf-in to 500 lbf-in | 1.9 %, but not less than 1.8 lbf-in     |         |
|   | > 41 lbf-ft to 260 lbf-ft  | 2.4 %, but not less than 1.2 lbf-ft     |         |

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

| Measured Parameter or Device Calibrated  | Range              | Uncertainty ( $k=2$ ) <sup>Note 3</sup> |                               |                                  |
|--|--------------------|---|-------------------------------|----------------------------------|
| <b>ELECTROMAGNETICS – RF/MICROWAVE</b>   |                    |   |                               |                                  |
| <b>NVLAP Code: 20/R13<br/>RF/MICROWAVE<br/>ATTENUATORS</b><br>Frequency range<br>150 kHz to 20 GHz | 0.0 dB to 10 dB    | With Type N Connector<br>0.16 dB        | With SMA Connector<br>0.17 dB | With 3.5 mm Connector<br>0.16 dB |
|  | > 10 dB to 20 dB   | 0.19 dB                                 | 0.20 dB                       | 0.18 dB                          |
|  | > 20 dB to 30 dB   | 0.21 dB                                 | 0.22 dB                       | 0.21 dB                          |
|  | > 30 dB to 40 dB   | 0.28 dB                                 | 0.29 dB                       | 0.28 dB                          |
|  | > 40 dB to 50 dB   | 0.30 dB                                 | 0.31 dB                       | 0.30 dB                          |
|  | > 50 dB to 60 dB   | 0.33 dB                                 | 0.33 dB                       | 0.32 dB                          |
|  | > 60 dB to 70 dB   | 0.35 dB                                 | 0.36 dB                       | 0.35 dB                          |
|  | > 70 dB to 80 dB   | 0.37 dB                                 | 0.38 dB                       | 0.37 dB                          |
|  | > 80 dB to 90 dB   | 0.44 dB                                 | 0.45 dB                       | 0.44 dB                          |
|  | > 90 dB to 100 dB  | 0.50 dB                                 | 0.51 dB                       | 0.50 dB                          |
|  | > 100 dB to 110 dB | 0.69 dB                                 | 0.70 dB                       | 0.69 dB                          |
|  | > 110 dB to 120 dB | 0.75 dB                                 | 0.76 dB                       | 0.75 dB                          |

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**National Voluntary  
Laboratory Accreditation Program**



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

| Measured Parameter<br>or<br>Device Calibrated             | Range          | Uncertainty ( $k=2$ ) <sup>Note 3</sup> | Remarks            |
|---|----------------|---|--------------------|
| <b>THERMODYNAMIC</b>                                      |                |   |                    |
| <b>NVLAP Code: 20/T03<br/>LABORATORY<br/>THERMOMETERS</b> | 0 °C to 200 °C | 0.091 °C                                | Comparison to SPRT |
| <b>END</b>  |                |   |                    |

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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.

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