



Standards Council of Canada
Conseil canadien des normes

Program for Accreditation of Laboratories – Canada
Programme d'accréditation des laboratoires – Canada



National Research Council Canada
Conseil national de recherches Canada

Calibration Laboratory Assessment Service
Service d'évaluation de laboratoires d'étalonnage

Certificate of Accreditation

Certificat d'accréditation

PYLON ELECTRONICS INC. (OTTAWA FACILITY)

147 Colonnade Road, Ottawa, Ontario

having been assessed by the National Research Council of Canada (NRC), under the authority of the Standards Council of Canada (SCC), and found to conform with the requirements of ISO/IEC 17025-2005, (CAN-P-4E), the conditions established by the SCC, and the NRC Calibration Laboratory Assessment Service (CLAS), and having demonstrated the capability of calibrating measurement instruments and standards and providing verified traceability to the national measurement standards of Canada, in specific fields and specified uncertainty limits, is hereby recognized as an

évalué par le Conseil national de recherches du Canada (CNRC), sous l'autorité du Conseil canadien des normes (CCN), déclaré conforme aux exigences d'ISO/CEI 17025-2005, (CAN-P-4E), ainsi qu'aux conditions établies par le CCN et le Service d'évaluation de laboratoires d'étalonnage (CLAS) du CNRC, et ayant prouvé ses compétences en matière d'étalonnage des instruments de mesure et des étalons, et de raccordement aux étalons nationaux du Canada, dans des domaines particuliers et des limites établies d'incertitude, est, en vertu du présent certificat, reconnu comme étant un

ACCREDITED CALIBRATION LABORATORY
for specific measurement capabilities which are hereby
CERTIFIED by CLAS



LABORATOIRE D'ÉTALONNAGE ACCRÉDITÉ
CERTIFIÉ par le CLAS
pour des capacités spécifiques de mesure

as listed in the Directory of the Canadian Calibration Network maintained by NRC and approved by the SCC. The national measurement standards of Canada are realized, maintained and disseminated by NRC under the authority of the *National Research Council Act* and the *Weights and Measures Act*. Bilateral agreements recognizing the equivalence of national measurement standards exist between NRC and other national metrology institutes. Copies of these agreements are available from NRC.

figurant dans le Répertoire du réseau canadien d'étalonnage établi par le CNRC et approuvé par le CCN. Les étalons nationaux du Canada sont établis, maintenus et émis par le CNRC en vertu de la *Loi sur le Conseil national de recherches* et de la *Loi sur les poids et mesures*. Il existe entre le CNRC et d'autres instituts nationaux de métrologie des accords bilatéraux qui reconnaissent l'équivalence des étalons nationaux de mesure. Le CNRC tient à la disposition du public des exemplaires de ces accords.

SCC Accredited Laboratory No.: 324, first issued on 2000-03-01
NRC CLAS Certificate No. 2000-02, first issued on 2000-03-01
Date of Issue: 2007-05-11, Date of Expiry: 2012-03-01

Numéro du laboratoire accrédité par le CCN : 324, délivré à l'origine le 2000-03-01
Numéro du certificat CNRC CLAS 2000-02, délivré à l'origine le 2000-03-01
Délivré le : 2007-05-11, date d'expiration : 2012-03-01



Chairman (SCC) / Président (CCN)

President (NRC) / Président (CNRC)

This accreditation is the formal recognition of the technical competence of the laboratory, for the approved scope. In addition, this laboratory has demonstrated that they operate a quality management system (refer to the SCC website for the joint ISO-ILAC-IAF Communiqué dated 2005-06-18).

Cette accréditation est la reconnaissance officielle de la compétence technique du laboratoire pour la portée d'accréditation approuvée. Ce laboratoire a également prouvé qu'il gère un système de management de la qualité (voir le site Web du CCN pour le communiqué commun ISO-ILAC-IAF daté du 18 juin 2005).

This certificate is the property of the Standards Council of Canada (SCC) and must be returned on request; reproduction is prohibited except on written approval of the SCC. The SCC and NRC recognize specific calibration capabilities but do not guarantee the accuracy of individual calibrations carried out by this accredited laboratory. Ce certificat est la propriété du Conseil canadien des normes (CCN) et doit lui être remis sur demande; toute reproduction sans l'autorisation écrite du CCN. Le CCN et le CNRC reconnaissent des capacités d'étalonnage spécifiques, mais ne garantissent pas l'exécution de tout étalonnage fait par ce laboratoire accrédité.



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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (\pm) (see Supplementary Notes)	Type	Remarks
<p>MICROMETERS: Outside, Inside, Depth</p> <p>Inch up to 6 inches</p>	<p>(44 + 2L) μinch (Note: L in 'inches')</p>	<p>II</p>	
<p>CALIPERS: Outside, Inside, Depth</p> <p>Inch up to 6 inches</p>	<p>410 μinch</p>	<p>II</p>	
<p>INDICATORS</p> <p>Inch, 0.001 inch graduations Inch, 0.0001 inch graduations Inch, 0.00005 inch graduations</p>	<p>170 μinch 30 μinch 25 μinch</p>	<p>II</p>	

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (\pm) (see Supplementary Notes)	Type	Remarks
<p>ELECTRICAL</p> <p>VOLTAGE, DC</p> <p>10 V</p> <p>0 mV to 329.9999 mV 0.33 V to 3.299999 V 3.3 V to 32.99999 V 33 V to 329.9999 V 330 V to 1000.000 V</p> <p>0 mV to 100 mV 0.1 V to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V</p>	<p>2.0 ppm</p> <p>0.002% + 1 μV 0.0011% + 2 μV 0.0012% + 20μV 0.0018% + 150 μV 0.0018% + 1500 μV</p> <p>0.0009% + 0.3 μV 0.0008% + 0.3 μV 0.0008% + 0.5 μV 0.001% + 30 μV 0.001% + 0.1 mV +0.0012%\times(Vin/1000)²</p>	<p>I</p> <p>II</p> <p>II</p>	<p>For calibration, in the Standards Calibration Laboratory, of solid-state voltage standards, saturated standard cells, calibrators and high accuracy digital multimeters</p> <p>Source. For the calibration of dc voltage measurement devices. On-site calibration available.</p> <p>Measure. For the calibration of dc voltage generating devices. On-site calibration available.</p>

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (\pm) (see Supplementary Notes)	Type	Remarks
<p>CURRENT, DC</p> <p>0 to 329.999 μA 0.330 mA 0 to 3.29999 mA 3.3 mA to 32.9999 mA 33 mA to 329.999 mA 0.33 A to 1.09999 A 1.1 A to 2.99999 A 3 A to 10.9999 A 11 A to 20.5 A</p> <p>0 to 100 nA 100 nA to 1 μA 1 μA to 10 μA 10 μA to 100 μA 100 μA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A</p>	<p>0.015% + 0.02 μA 0.01% + 0.05 μA 0.01% + 0.25 μA 0.01% + 2.5 μA 0.02% + 40 μA 0.038% + 40 μA 0.05% + 500 μA 0.1% + 750 μA</p> <p>0.003% + 40 pA 0.002% + 40 pA 0.002% + 0.1 nA 0.002% + 0.8 nA 0.002% + 5 nA 0.002% + 50 nA 0.0035% + 0.5 μA 0.011% + 10 μA</p>	<p>II</p>	<p>Source. For the calibration of dc current measurement devices. On-site calibration available.</p> <p>Measure. For the calibration of dc current generating devices. On-site calibration available.</p>

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (\pm) (see Supplementary Notes)	Type	Remarks
<p>RESISTANCE, DC</p> <p>0 Ω to 10.9999 Ω 11 Ω to 32.9999 Ω 33 Ω to 109.9999 Ω 110 Ω to 329.9999 Ω 330 Ω to 1.099999 kΩ 1.1 kΩ to 3.299999 kΩ 3.3 kΩ to 10.99999 kΩ 11 kΩ to 32.99999 kΩ 33 kΩ to 109.9999 kΩ 110 kΩ to 329.9999 kΩ 330 kΩ to 1.099999 MΩ 1.1 MΩ to 3.299999 MΩ 3.3 MΩ to 10.99999 MΩ 11 MΩ to 32.99999 MΩ 33 MΩ to 109.9999 MΩ 110 MΩ to 329.9999 MΩ 330 MΩ to 1100 MΩ</p> <p>0.47 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ</p>	<p>0.004% + 0.001 Ω 0.003% + 0.0015 Ω 0.0028% + 0.0014 Ω 0.0028% + 0.002 Ω 0.0028% + 0.002 Ω 0.0028% + 0.02 Ω 0.0028% + 0.02 Ω 0.0028% + 0.2 Ω 0.0028% + 0.2 Ω 0.0032% + 2 Ω 0.0032% + 2 Ω 0.006% + 30 Ω 0.0130% + 50 Ω 0.025% + 2500 Ω 0.05% + 3000 Ω 0.3% + 100000 Ω 1.5% + 500000 Ω</p> <p>0.0015% + 50 $\mu\Omega$ 0.0012% + 0.5 mΩ 0.001% + 0.5 mΩ 0.001% + 5 mΩ 0.001% + 50 mΩ 0.0015% + 2 Ω 0.005% + 100 Ω 0.05% + 1 kΩ 0.5% + 10 kΩ</p>	<p>II</p>	<p>Source. For the calibration of resistance measurement devices. On-site calibration available.</p> <p>Measure. Using a multimeter. On-site calibration available.</p>

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Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (see Supplementary Notes)	Type	Remarks
<p>VOLTAGE, AC</p> <p>1 mV to 32.999 mV 33 mV to 329.999 mV 0.33 V to 3.29999 V 3.3 V to 32.9999 V 33 V to 329.999 V 330 V to 1020 V</p> <p>1 mV to 10 mV 10 mV to 10 V 10 V to 100 V 100 V to 700 V</p>	<p>10 Hz to 500 kHz 10 Hz to 500 kHz 10 Hz to 500 kHz 10 Hz to 100 kHz 45 Hz to 100 kHz 45 Hz to 10 kHz</p> <p>1 Hz to 8 MHz 1 Hz to 10 MHz 1 Hz to 1 MHz 1 Hz to 100 kHz</p>	<p>0.033% to 5.8% 0.017% to 0.41% 0.017% to 0.42% 0.017% to 0.14% 0.020% to 0.35% 0.026% to 0.033%</p> <p>0.031% to 21% 0.009% to 16% 0.022% to 1.6% 0.042% to 0.3%</p>	<p>II</p>	<p>Source. For the calibration of sinewave voltage measurement devices. See Annex A for details. On-site calibration available.</p> <p>Measure. For the calibration of sinewave voltage generating devices. On-site calibration available.</p>
<p>CURRENT, AC</p> <p>29 μA to 329.99 μA 0.33 mA to 3.2999 mA 3.3 mA to 32.999 mA 33 mA to 329.99 mA 0.33 A to 1.09999 A 1.1 A to 2.99999 A 3 A to 10.9999 A 11 A to 20.5 A</p> <p>10 μA to 100 μA 0.1 mA to 100 mA 0.1 A to 1 A</p>	<p>10 Hz to 30 kHz 10 Hz to 30 kHz 10 Hz to 30 kHz 10 Hz to 30 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 45 Hz to 5 kHz 45 Hz to 5 kHz</p> <p>10 Hz to 5 kHz 10 Hz to 100 kHz 10 Hz to 50 kHz</p>	<p>0.16% to 3.0% 0.10% to 1.2% 0.046% to 0.52% 0.046% to 1.0% 0.059% to 4.0% 0.063% to 3.0% 0.078% to 3.1% 0.14% to 3.0%</p> <p>0.09% to 0.18% 0.05% to 0.7% 0.1% to 1%</p>	<p>II</p>	<p>Source. For the calibration of sinewave current measurement devices. See Annex B for details. On-site calibration available.</p> <p>Measure. For the calibration of sinewave current generating devices. On-site calibration available.</p>

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Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (see Supplementary Notes)	Type	Remarks
Frequency	1 Hz to 40 Hz 40 Hz to 10 MHz	0.05% 0.01%	II	Measure. For the calibration of frequency generating devices. On-site calibration available.
CAPACITANCE 0.19 nF to 0.3999 nF 0.4 nF to 1.0999 nF 1.1 nF to 3.2999 nF 3.3 nF to 10.9999 nF 11 nF to 32.9999 nF 33 nF to 109.999 nF 110 nF to 329.999 nF 0.33 μ F to 1.09999 μ F 1.1 μ F to 3.29999 μ F 3.3 μ F to 10.9999 μ F 11 μ F to 32.9999 μ F 33 μ F to 109.999 μ F 110 μ F to 329.999 μ F 0.33 mF to 1.09999mF 1.1 mF to 3.2999 mF 3.3 mF to 10.9999 mF 11 mF to 32.9999 mF 33 mF to 110 mF	10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 600 Hz 10 Hz to 300 Hz 10 Hz to 150 Hz 10 Hz to 120 Hz 10 Hz to 80 Hz 0 to 50 Hz 0 to 20 Hz 0 to 6 Hz 0 to 2 Hz 0 to 0.6 Hz 0 to 0.2 Hz	0.5% + 0.01 nF 0.5% + 0.01 nF 0.5% + 0.01 nF 0.25% + 0.01 nF 0.25% + 0.1 nF 0.25% + 0.1 nF 0.25% + 0.3 nF 0.25% + 1 nF 0.25% + 3 nF 0.25% + 10 nF 0.40% + 30 nF 0.45% + 100 nF 0.45% + 300 nF 0.45% + 1 μ F 0.45% + 3 μ F 0.45% + 10 μ F 0.75% + 30 μ F 1.1% + 100 μ F	II	Source. Synthesized capacitance using a multi-product calibrator. For the calibration of capacitance measuring devices. On-site calibration available.

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (\pm) (see Supplementary Notes)	Type	Remarks
<p>ELECTRICAL CALIBRATION OF TEMPERATURE INDICATORS AND SIMULATORS</p> <p>Thermocouple simulation</p> <p>Type B: 600 to 800°C 800 to 1000°C 1000 to 1550°C 1550 to 1820°C</p> <p>Type E: -250 to -100°C -100 to -25°C -25 to 350°C 350 to 650°C 650 to 1000°C</p> <p>Type J: -210 to -100°C -100 to -30°C -30 to 150°C 150 to 760°C 760 to 1200°C</p> <p>Type K: -200 to -100°C -100 to -25°C -25 to 120°C 120 to 1000°C 1000 to 1372°C</p> <p>Type N: -200 to -100°C -100 to -25°C -25 to 120°C 120 to 410°C 410 to 1300°C</p> <p>Type R: 0 to 250°C 250 to 400°C 400 to 1000°C 1000 to 1767°C</p> <p>Type S: 0 to 250°C 250 to 1000°C 1000 to 1400°C 1400 to 1767°C</p> <p>Type T: -250 to -150°C -150 to 0°C 0 to 120°C 120 to 400°C</p> <p>Type U: -200 to 0°C 0 to 600°C</p>	<p>0.44°C 0.34°C 0.30°C 0.33°C 0.50°C 0.16°C 0.14°C 0.16°C 0.21°C 0.27°C 0.16°C 0.14°C 0.17°C 0.23°C 0.33°C 0.18°C 0.16°C 0.26°C 0.40°C 0.40°C 0.22°C 0.19°C 0.18°C 0.27°C 0.57°C 0.35°C 0.33°C 0.40°C 0.47°C 0.36°C 0.37°C 0.46°C 0.63°C 0.24°C 0.16°C 0.14°C 0.56°C 0.27°C</p>	<p>II</p>	<p>Source using multifunction calibrators.</p> <p>Suitable for the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.</p>

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (\pm) (see Supplementary Notes)	Type	Remarks
RTD simulation -200 °C to 630 °C	0.04 °C to 0.23 °C	II	Suitable for the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.

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Supplementary Notes

- A. The calibration capabilities of the laboratory are traceable to the International System of Units (SI) or to standards acceptable to Calibration Laboratory Assessment Service (CLAS) of the National Research Council (NRC).
- B. The CLAS classifies the calibration capabilities of its laboratories according to the following types::
- Type I: A capability of which the primary purpose is the calibration of measurement standards for other calibration laboratories. A laboratory with this type of capability has the appropriate reference standards, working standards, check standards, and calibration systems to be able to assess dynamically and to quantify its measurement uncertainty, and is able to monitor its measurement processes continually. The environmental conditions that affect the laboratory's measurements are closely monitored and controlled. A laboratory with this type of capability usually reports a measurement value accompanied by a comprehensive statement of uncertainty. A laboratory with this type of capability is often referred to as a standards or standards calibration laboratory.
- Type II: A capability of which the main purpose is the calibration and adjustment of test, measurement and diagnostic equipment for use in product testing, manufacturing, servicing, etc. A laboratory with this type of capability has the appropriate working standards and calibration systems to be able to calibrate to a manufacturer's specification and tolerance or calibrate to a written standard, using appropriate test uncertainty ratios (TUR). A laboratory with this type of capability usually reports a measurement value and indicates if the test equipment complies with a specification, tolerance or a written standard. It will, usually, base its capabilities on the specifications and tolerances of the working standards being used. It also has, normally, the means to check its working standards between calibrations and has available the appropriate environment(s). A laboratory with this type of capability is often referred to as a test equipment calibration laboratory.
- Type III: A calibration capability, within a laboratory, mobile or fixed, with the appropriate reference or working standards, of which the main purpose is to provide a reference. A laboratory with this type of capability usually has minimal means to monitor its calibration system. It relies mainly on the values assigned by higher echelon laboratories to its standards and uses these values with few other considerations to assign values or verify the compliance of equipment being calibrated to their specifications and tolerances or to written standards. This could be an on-site service subject to a wide range of environmental factors.
- C. The best measurement capability of the laboratory includes the uncertainty associated with the calibration of the laboratory's reference or transfer standard by NRC, or by a laboratory acceptable to CLAS, uncertainties caused by the transportation of the calibrated reference standard from NRC (or other laboratories) to the laboratory, uncertainties of the calibration process in the laboratory, and uncertainties due to the behaviour of the most ideal available standard or measurement device for a specific measurement technology. These uncertainties include components which could have been evaluated by statistical methods on a series of repeated measurements and which can be characterised by experimental standard deviations. The other components, which can also be characterized by standard deviations, are evaluated from assumed probability distributions based on experience or other information. These have been combined to form an expanded uncertainty $U = ku_c$ with U determined from a combined standard uncertainty u_c and a coverage factor $k = 2$. Since it can be assumed that the probability distribution characterised by the reported result and u_c is approximately normal, the value of a calibrated device can be asserted to lie in the interval represented by the expanded uncertainty U with a level of confidence of approximately 95 percent. The uncertainties quoted do not include the possible effects on the calibrated device of transportation, long term stability or intended use.
- D. The uncertainty of a specific calibration by the laboratory can be greater than the best measurement capability because it will include uncertainties due to the actual condition and behaviour of the customer's device during its calibration.
- E. CLAS certification and SCC accreditation is the formal recognition of specific calibration capabilities. Neither the NRC nor SCC guarantees the accuracy of individual calibrations by the laboratory.

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Annex A						
Best Measurement Capability for the Calibration of Sinewave Voltage Measuring Devices, expressed as \pm { (% of reading) + residual in μV }						
Frequency						
Voltage, ac	10 Hz to 45 Hz	45 Hz to 10 kHz	10 kHz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz	100 kHz to 500 kHz
1.0 mV to 32.999 mV	0.08 + 6	0.015 + 6	0.02 + 6	0.1 + 6	0.35 + 12	0.8 + 50
33 mV to 329.999 mV	0.03 + 8	0.0145 + 8	0.016 + 8	0.035 + 8	0.08 + 32	0.2 + 70
0.33 V to 3.29999 V	0.03 + 50	0.015 + 60	0.019 + 60	0.03 + 50	0.07 + 125	0.24 + 600
3.3 V to 32.9999 V	0.03 + 650	0.015 + 600	0.024 + 600	0.035 + 600	0.09 + 1600	
	45 Hz to 1 kHz	1 kHz to 10 kHz	10 kHz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz	
33 V to 329.999 V	0.019 + 2000	0.02 + 6000	0.025 + 6000	0.03 + 6000	0.2 + 50000	
	45 Hz to 1 kHz	1 kHz to 5 kHz	5 kHz to 10 kHz			
330 V to 1020 V	0.03 + 10000	0.025 + 10000	0.03 + 10000			

Annex B						
Best Measurement Capability for the Calibration of Sinewave Current Measuring Devices, expressed as \pm { (% of reading) + residual in μA }						
Frequency						
Current, ac	10 Hz to 20 Hz	20 Hz to 45 Hz	45 Hz to 1 kHz	1 kHz to 5 kHz	5 kHz to 10 kHz	10 kHz to 30 kHz
29 μA to 329.99 μA	0.2 + 0.1	0.15 + 0.1	0.125 + 0.1	0.3 + 0.15	0.8 + 0.2	1.6 + 0.4
0.33 mA to 3.2999 mA	0.2 + 0.15	0.125 + 0.15	0.1 + 0.15	0.2 + 0.2	0.5 + 0.3	1 + 0.6
3.3 mA to 32.999 mA	0.18 + 2	0.09 + 2	0.04 + 2	0.08 + 2	0.2 + 3	0.4 + 4
33 mA to 329.99 mA	0.18 + 20	0.09 + 20	0.04 + 20	0.10 + 50	0.2 + 100	0.4 + 200
	10 Hz to 45 Hz	45 Hz to 1 kHz	1 kHz to 5 kHz	5 kHz to 10 kHz		
0.33 A to 1.09999 A	0.18 + 100	0.05 + 100	0.6 + 1000	2.5 + 5000		
1.1 A to 2.99999 A	0.18 + 100	0.06 + 100	0.6 + 1000	2.5 + 5000		
	45 Hz to 100 Hz	100 Hz to 1 kHz	1 kHz to 5 kHz			
3 A to 10.9999 A	0.06 + 2000	0.1 + 2000	3 + 2000			
11 A to 20.5 A	0.12 + 5000	0.15 + 5000	3 + 5000			