



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc., has assessed the Laboratory of:

***Precision Measurements
20 Hagerty Road, Suite 1
West Chester, PA 19382***

(Hereinafter called the Organization) and hereby declares that Organization is accredited in accordance with the recognized International Standard:

ISO/IEC 17025:2005

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (as outlined by the joint ISO-ILAC-IAF Communiqué dated January 2009):

***Calibration of Electrical and Pressure Measuring and Test Equipment
(As detailed in the supplement)***

Such testing and/or calibration services shall only be offered at or from the address given above. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

The validity of this certificate is mandated through ongoing surveillance.

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

Initial Accreditation Date:

June 26, 2008

Accreditation No.:

62582

Issue Date:

August 04, 2010

Certificate No.:

L10-116

Expiration Date:

August 03, 2012

Page No.:

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Certificate of Accreditation: Supplement

Precision Measurements
20 Hagerty Road, Suite 1
West Chester, PA 19382

Accreditation is granted to this facility to perform the following calibrations:

Electrical

| MEASURED QUANTITY, INSTRUMENT OR GAUGE | RANGE (AND SPECIFICATION WHERE APPROPRIATE) | BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm) | REMARKS |
|--|---|---|--|
| Temperature Calibration, Indication and Control Equipment used with RTD Pt 395, 100 Ω | - 200 °C to - 80 °C | 0.05 °C | Electrical Simulation of Thermocouple Output Fluke 5520A/SC600 |
| | - 80 °C to 0 °C | 0.05 °C | |
| | 0 °C to 100 °C | 0.07 °C | |
| | 100 °C to 300 °C | 0.09 °C | |
| | 300 °C to 400 °C | 0.10 °C | |
| | 400 °C to 630 °C | 0.12 °C | |
| | 630 °C to 800 °C | 0.23 °C | |
| Temperature Calibration, Indication and Control Equipment used with RTD Pt 3926, 100 Ω | - 200 °C to - 80 °C | 0.05 °C | |
| | - 80 °C to 0 °C | 0.05 °C | |
| | 0 °C to 100 °C | 0.07 °C | |
| | 100 °C to 300 °C | 0.09 °C | |
| | 300 °C to 400 °C | 0.10 °C | |
| | 400 °C to 630 °C | 0.12 °C | |
| Temperature Calibration, Indication and Control Equipment used With RTD Pt 3916, 100 | - 200 °C to - 190 °C | 0.25 °C | |
| | - 190 °C to - 80 °C | 0.04 °C | |
| | - 80 °C to 0 °C | 0.05 °C | |
| | 0 °C to 100 °C | 0.06 °C | |
| | 100 °C to 260 °C | 0.07 °C | |
| | 260 °C to 300 °C | 0.08 °C | |
| | 300 °C to 400 °C | 0.09 °C | |
| | 400 °C to 600 °C | 0.10 °C | |
| Temperature Calibration, Indication and Control Equipment used With RTD Pt 385, 200 Ω | - 200 °C to - 80 °C | 0.04 °C | |
| | - 80 °C to 0 °C | 0.04 °C | |
| | 0 °C to 100 °C | 0.04 °C | |
| | 100 °C to 260 °C | 0.05 °C | |
| | 260 °C to 300 °C | 0.12 °C | |
| | 300 °C to 400 °C | 0.13 °C | |
| | 400 °C to 600 °C | 0.14 °C | |
| | 600 °C to 630 °C | 0.16 °C | |



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|---|---|---|--|
| Temperature calibration, Indication and Control Equipment used with RTD Pt 385, 500 Ω | - 200 $^{\circ}\text{C}$ to - 80 $^{\circ}\text{C}$ | 0.04 $^{\circ}\text{C}$ | Electrical Simulation of Thermocouple Output Fluke 5520A/SC600 |
| | - 80 $^{\circ}\text{C}$ to 0 $^{\circ}\text{C}$ | 0.05 $^{\circ}\text{C}$ | |
| | 0 $^{\circ}\text{C}$ to 100 $^{\circ}\text{C}$ | 0.05 $^{\circ}\text{C}$ | |
| | 100 $^{\circ}\text{C}$ to 260 $^{\circ}\text{C}$ | 0.06 $^{\circ}\text{C}$ | |
| | 260 $^{\circ}\text{C}$ to 300 $^{\circ}\text{C}$ | 0.08 $^{\circ}\text{C}$ | |
| | 300 $^{\circ}\text{C}$ to 400 $^{\circ}\text{C}$ | 0.08 $^{\circ}\text{C}$ | |
| | 400 $^{\circ}\text{C}$ to 600 $^{\circ}\text{C}$ | 0.09 $^{\circ}\text{C}$ | |
| | 600 $^{\circ}\text{C}$ to 630 $^{\circ}\text{C}$ | 0.11 $^{\circ}\text{C}$ | |
| Temperature calibration, Indication and Control Equipment used with RTD Pt 385, 1 k Ω | - 200 $^{\circ}\text{C}$ to - 80 $^{\circ}\text{C}$ | 0.03 $^{\circ}\text{C}$ | |
| | - 80 $^{\circ}\text{C}$ to 0 $^{\circ}\text{C}$ | 0.03 $^{\circ}\text{C}$ | |
| | 0 $^{\circ}\text{C}$ to 100 $^{\circ}\text{C}$ | 0.04 $^{\circ}\text{C}$ | |
| | 100 $^{\circ}\text{C}$ to 260 $^{\circ}\text{C}$ | 0.05 $^{\circ}\text{C}$ | |
| | 260 $^{\circ}\text{C}$ to 300 $^{\circ}\text{C}$ | 0.06 $^{\circ}\text{C}$ | |
| | 300 $^{\circ}\text{C}$ to 400 $^{\circ}\text{C}$ | 0.07 $^{\circ}\text{C}$ | |
| | 400 $^{\circ}\text{C}$ to 600 $^{\circ}\text{C}$ | 0.07 $^{\circ}\text{C}$ | |
| | 600 $^{\circ}\text{C}$ to 630 $^{\circ}\text{C}$ | 0.23 $^{\circ}\text{C}$ | |
| Temperature calibration, Indication and Control Equipment used with RTD Ni 120, 120 Ω | - 80 $^{\circ}\text{C}$ to 0 $^{\circ}\text{C}$ | 0.08 $^{\circ}\text{C}$ | |
| | 0 $^{\circ}\text{C}$ to 100 $^{\circ}\text{C}$ | 0.08 $^{\circ}\text{C}$ | |
| | 100 $^{\circ}\text{C}$ to 260 $^{\circ}\text{C}$ | 0.14 $^{\circ}\text{C}$ | |
| Temperature calibration, Indication and Control Equipment used with RTD Cu 427, 10 Ω | -100 $^{\circ}\text{C}$ to 260 $^{\circ}\text{C}$ | 0.30 $^{\circ}\text{C}$ | |
| DC Voltage-Generate | 1 mV to 100 mV | 21 $\mu\text{V}/\text{V}$ | |
| | 100 mV to 1.0 V | 21 $\mu\text{V}/\text{V}$ | |
| | 1.0 V to 10 V | 170 $\mu\text{V}/\text{V}$ | |
| | 10 V to 100 V | 2.2 mV/V | |
| | 100 V to 1 000 V | 22 mV/V | |
| DC Voltage-Measure | Up to 100 mV | 6.2 $\mu\text{V}/\text{V}$ + 0.3 μV | HP 3458A |
| | 0.1 V to 1 V | 5.2 $\mu\text{V}/\text{V}$ + 0.3 μV | |
| | 1 V to 10 V | 5.2 $\mu\text{V}/\text{V}$ + 0.5 μV | |
| | 10 V to 100 V | 7.3 $\mu\text{V}/\text{V}$ + 0.3 μV | |



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| DC Voltage-Measure | 10 kV to 20 kV | 2.3 % of reading | Fluke 80K-40 with HP 3458A |
| | 20 kV to 35 kV | 1.5 % of reading | |
| | 35 kV to 40 kV | 2.3 % of reading | |
| DC Current – Generate | 10 μ A to 1 A | .20% | Fluke 5520A/6 |
| | 1 A to 20.5 A | 0.18 % | |
| DC Current – Measure | 100 pA to 100 μ A | 24 μ A/A + 0.8 nA | HP 3458A with Weston shunt |
| | 0.1 mA to 1 mA | 24 μ A/A + 5 nA | |
| | 1 mA to 10 mA | 24 μ A/A 50 nA | |
| | 10 mA to 100 mA | 41 μ A/A + 0.5 μ A | |
| | 0.1 A to 1 A | 0.013 % + 10 μ A | |
| | 1 A to 600 A | 0.29 % of reading | |
| DC Resistance – Generate | 0 Ω to 10 Ω | 450 $\mu\Omega/\Omega$ + 0.001 Ω | Fluke 5520A/SC600 |
| | 10 Ω to 100 Ω | 3.3 m Ω/Ω + 0.001 4 Ω | |
| | 100 Ω to 1 k Ω | 30 m Ω/Ω + 0.002 Ω | |
| | 1 k Ω to 10 k Ω | 0.30 Ω/Ω + 0.02 Ω | |
| | 100 k Ω to 1 000 k Ω | 0.037 % + 2 Ω | |
| | 1 M Ω to 10 M Ω | 0.015 % + 50 Ω | |
| | 10 M Ω to 100 M Ω | 0.072 % + 3 000 Ω | |
| DC Resistance- Measure | 0.1 Ω to 10 Ω | 19 $\mu\Omega/\Omega$ + 0.05 m Ω | HP 3458A |
| | 10 Ω to 100 Ω | 15 $\mu\Omega/\Omega$ + 0.5 m Ω | |
| | 0.1 k Ω to 1 k Ω | 13 $\mu\Omega/\Omega$ + 0.5 m Ω | |
| | 1 k Ω to 10 k Ω | 13 $\mu\Omega/\Omega$ + 5 m Ω | |
| | 10 k Ω to 100 k Ω | 13 $\mu\Omega/\Omega$ + 0.05 Ω | |
| | 0.1 M Ω to 1 M Ω | 24 $\mu\Omega/\Omega$ + 2 Ω | |
| | 1 M Ω to 10 M Ω | 65 $\mu\Omega/\Omega$ + 100 Ω | |
| | 10 M Ω to 100 M Ω | 0.058 % + 1 k Ω | |
| | 0.1 G Ω to 1.2 G Ω | 0.58 % + 10 k Ω | |
| AC Voltage – Generate | | | |
| 1 mV to 330 mV | 45 Hz to 10 kHz | 0.026 % | Fluke 5520A/6 |
| 330 mV to 3.3 V | 45 Hz to 10 kHz | 0.054 % | |
| 3.3 V to 33 V | 45 Hz to 10 kHz | 0.026 % | |
| 33 V to 330 V | 45 Hz to 10 kHz | 0.042 % | |



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|---|---|---|--|
| AC Voltage- Measure | | | |
| 1 Hz to 40 Hz | 3 μ V to 10 mV | 0.03 % + 3 μ V | HP 3458 A Synchronous sub-sampled mode |
| 40 Hz to 1 kHz | 3 μ V to 10 mV | 0.02 % + 1.1 μ V | |
| 1 kHz to 20 kHz | 3 μ V to 10 mV | 0.03 % + 1.1 μ V | |
| 20 kHz to 50 kHz | 3 μ V to 10 mV | 0.12 % + 1.1 μ V | |
| 50 kHz to 100 kHz | 3 μ V to 10 mV | 0.58 % + 1.1 μ V | |
| 100 kHz to 300 kHz | 3 μ V to 10 mV | 4.6 % + 2 μ V | |
| AC Voltage- Measure | | | |
| 1 Hz to 40 Hz | 10 mV to 100 mV | 80 μ V/V + 4 μ V | HP 3458 A Synchronous sub-sampled mode |
| 40 Hz to 1 kHz | 10 mV to 100 mV | 80 μ V/V + 2 μ V | |
| 1 kHz to 20 kHz | 10 mV to 100 mV | 0.02 % + 2 μ V | |
| 20 kHz to 50 kHz | 10 mV to 100 mV | 0.03 % + 2 μ V | |
| 50 kHz to 100 kHz | 10 mV to 100 mV | 0.09 % + 2 μ V | |
| 100 kHz to 300 | 10 mV to 100 mV | 0.35 % + 10 μ V | |
| 0.3 MHz to 1 MHz | 10 mV to 100 mV | 1.2 % + 10 μ V | |
| 1 MHz to 2 MHz | 10 mV to 100 mV | 1.7 % + 10 μ V | |
| AC Voltage- Measure | | | |
| 1 Hz to 40 Hz | 0.1 V to 1 V | 80 μ V/V + 40 μ V | HP 3458 A Synchronous sub-sampled mode |
| 40 Hz to 1 kHz | 0.1 V to 1 V | 80 μ V/V + 20 μ V | |
| 1 kHz to 20 kHz | 0.1 V to 1 V | 0.02 % + 20 μ V | |
| 20 kHz to 50 kHz | 0.1 V to 1 V | 0.03 % + 20 μ V | |
| 50 kHz to 100 kHz | 0.1 V to 1 V | 0.09 % + 20 μ V | |
| 100 kHz to 300 | 0.1 V to 1 V | 0.35 % + 100 μ V | |
| 0.3 MHz to 1 MHz | 0.1 V to 1 V | 1.2 % + 100 μ V | |
| 1 MHz to 2 MHz | 0.1 V to 1 V | 1.7 % + 100 μ V | |
| AC Voltage- Measure | | | |
| 1 Hz to 40 Hz | 1 V to 10 V | 80 μ V/V + 0.4 mV | HP 3458 A Synchronous sub-sampled mode |
| 40 Hz to 1 kHz | 1 V to 10 V | 80 μ V/V + 0.2 mV | |
| 1 kHz to 20 kHz | 1 V to 10 V | 0.02 % + 0.2 mV | |
| 20 kHz to 50 kHz | 1 V to 10 V | 0.03 % + 0.2 mV | |
| 50 kHz to 100 kHz | 1 V to 10 V | 0.09 % + 0.2 mV | |



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|--|---|---|--|
| AC Voltage- Measure | | | |
| 100 kHz to 300 MHz | 1 V to 10 V | 0.35 % + 1 mV | HP 3458 A Synchronous sub-sampled mode |
| 0.3 MHz to 1 MHz | 1 V to 10 V | 1.2 % + 1 mV | |
| 1 MHz to 2 MHz | 1 V to 10 V | 1.7 % + 1 mV | |
| AC Voltage- Measure | | | |
| 1 Hz to 40 Hz | 10 V to 100 V | 0.02 % + 4 mV | HP 3458 A Synchronous sub-sampled mode |
| 40 Hz to 1 kHz | 10 V to 100 V | 0.02 % + 4 mV | |
| 20 kHz to 50 kHz | 10 V to 100 V | 0.04 % + 2 mV | |
| 50 kHz to 100 kHz | 10 V to 100 V | 0.14 % + 2 mV | |
| 100 kHz to 300 | 10 V to 100 V | 0.46 % + 10 mV | |
| 0.3 MHz to 1 MHz | 10 V to 100 V | 1.7 % + 10 mV | |
| AC Voltage- Measure | | | |
| 1 Hz to 40 Hz | 100 V to 700 V | 0.05 % + 40 mV | HP 3458 A Synchronous sub-sampled mode |
| 40 Hz to 1 kHz | 100 V to 700 V | 0.05 % + 20 mV | |
| 1 kHz to 20 kHz | 100 V to 700 V | 0.07 % + 20 mV | |
| 20 kHz to 50 kHz | 100 V to 700 V | 0.14 % + 20 mV | |
| Phase Modulation- Measure 200 Hz to 10 kHz | 150 kHz to 10 MHz | 4 % of reading + 1 digit | HP 8902A w/ 11793A |
| | 10 MHz to 1.3 GHz | 3% of reading + 1 digit | |
| Phase Modulation- Measure 200 Hz to 20 kHz | 1.3 GHz to 26.5 GHz | 4 % of reading + 1 digit | HP 8902A w/ 11793A |
| Amplitude Modulation- Measure Rate: 50 Hz to 10 kHz Depths: 5 % to 99 % | 150 kHz to 10 MHz | 2 % of reading + 1 digit | HP 8902A w/ 11793A |
| Amplitude Modulation- Measure Rate: 20 Hz to 10 kHz Depths: to 99 % | 150 kHz to 10 MHz | 3 % of reading + 1 digit | HP 8902A w/ 11793A |
| Amplitude Modulation- Measure Rate: 50 Hz to 50 kHz Depths: 5 % to 99 % | 10 MHz to 1.3 GHz | 1 % of reading + 1 digit | HP 8902A w/ 11793A |



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|--|---|---|--------------------|
| Amplitude Modulation- Measure Rate: 20 Hz to 100 kHz Depths: to 99 % | 10 MHz to 1.3 GHz | 3 % of reading + 1 digit | HP 8902A w/ 11793A |
| Amplitude Modulation- Measure Rate: 20 Hz to 100 kHz Depths: 5 % to 99 % | 1.3 GHz to 26.5 GHz | 1.5 % of reading + 1 digit | HP 8902A w/ 11793A |
| Amplitude Modulation- Measure Rate: 20 Hz to 100 kHz Depths: to 99 % | 1.3 GHz to 26.5 GHz | 3 % of reading + 1 digit | HP 8902A w/ 11793A |
| Amplitude Modulation- Generate Rate: 50 Hz to 100 kHz Depths: 5 % to 99 % | 10 kHz to 0.99 GHz | 0.1 % | HP 8656B |
| Frequency Modulation- Measure Rate 20 Hz to 10 kHz Dev.: ≤ 40 kHz peak | 250 kHz to 10 MHz | 2 % of reading + 1 digit | HP 8902A w/ 11793A |
| Frequency Modulation- Measure Rate 50 Hz to 100 kHz Dev.: ≤ 400 kHz peak | 10 MHz to 1.3 GHz | 1 % of reading + 1 digit | HP 8902A w/ 11793A |
| Frequency Modulation- Measure Rate 20 Hz to 200 kHz Dev.: ≤ 400 kHz peak | 10 MHz to 1.3 GHz | 5 % of reading + 1 digit | HP 8902A w/ 11793A |
| Frequency Modulation- Measure Rate 50 Hz to 100 kHz Dev.: ≤ 400 kHz peak | 1.3 GHz to 26.5 GHz | 1 % of reading + 1 digit | HP 8902A w/ 11793A |
| Frequency Modulation- Measure Rate 20 Hz to 200 kHz Dev.: ≤ 400 kHz peak | 1.3 GHz to 26.5 GHz | 5 % of reading + 1 digit | HP 8902A w/ 11793A |



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Dimensional

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|--|---|---|--|
| Micrometer, Height, and Depth Gages | 0 in to 24 in | (67 + 1.6L) μ in | Gage Blocks |
| Dial Indicators | 0 in to 2 in | (70 + 1.6L) μ in | Gage Blocks |
| Pin Gages | 0 in to 4 in | (19 + 15L) μ in | Gage Blocks |
| Rulers/Tape Measure | Up to 25 ft | 0.009 0 in | Gage Blocks with Calipers |
| Levels | Up to 48 in | (0.6R + 500L) μ in | Master precision level and surface plate |
| Conductivity-Measuring Equipment | 45 μ S, 450 μ S, 1 500 μ S, 4 500 μ S | 1.2 % of reading | Standard Solutions |
| pH-Measuring Equipment | 4 pH, 7 pH, 10 pH | 0.020 pH units | Standard Solutions |
| Viscosity Meter Calibration | To 33 % of Scale | 2.7 % | Viscosity Solutions |
| | 33 % to 66 % of Scale | 1.8 % | |
| | 66 % to 100 % of Scale | 1.7 % | |

Mass

| MEASURED QUANTITY, INSTRUMENT OR GAUGE | RANGE (AND SPECIFICATION WHERE APPROPRIATE) | BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm) | REMARKS |
|--|---|---|-----------------|
| Scales and Balances | 1 mg to 100 mg | 0.026 mg | Class 1 Weights |
| | 10 mg to 500 mg | 0.043 mg | |
| | 1 g to 50 g | 0.15 mg | |
| | 50 g to 300 g | 0.90 mg | |
| | 300 g to 500 g | 1.7 mg | |
| | 0.5 kg to 1 kg | 3.7 mg | |
| | 1 kg to 3 kg | 8 mg | |
| | 3 kg to 5 kg | 12 mg | |
| | 5 kg to 10 kg | 34 mg | Class F Weights |
| | 1 lb to 5 lb | 0.000 60 lb | |
| | 3 lb to 10 lb | 0.001 lb | |
| | 10 lb to 25 lb | 0.004 lb | |
| | 25 lb to 50 lb | 0.006 lb | |
| | 50 lb to 100 lb | 0.02 lb | |
| 100 lb to 600 lb | 0.02 lb | | |
| Force-Load Cells/Force Gauges Tension | 0 lbf to 600 lbf | 0.98 lbf | Class F Weights |



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Mechanical

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|--|---|---|-----------------------------|
| Torque Transducers | 0 ft-lb to 1 000 ft-lb | 0.26 % of reading | AKO TSD -0251 torque system |
| RPM Measuring Equipment | 0 rpm to 100 000 rpm | 0.59 % of reading | Agilent 53132A |
| Gas Flow | 5 sccm to 500 sccm | 0.29 % of Full Scale | SL-800 Gas Flow Calibrator |
| | 50 sccm to 5 000 sccm | 0.29 % of Full Scale | |
| Gas Concentration Alarms-Carbon Monoxide (CO) | 25 ppm | 2.8 ppm | Standard Gases |
| | 50 ppm | 5.5 ppm | |
| Gas Concentration Alarms-Sulfur Dioxide (SO ₂) | 10 ppm | 2 ppm | |
| Air Velocity-Measure | 300 ft/min to 500 ft/min | 1.5 % of reading | TSI 8386 |
| | 500 ft/min to 2 000 ft/min | 1.6 % of reading | |
| | 2 000 ft/min to 2 800 ft/min | 1.8 % of reading | |
| | 2 800 ft/min to 4 500 ft/min | 2.2 % of reading | |
| | 4 500 ft/min to 7 000 ft/min | 1.7 % of reading | |

Thermodynamic

| MEASURED QUANTITY, INSTRUMENT OR GAUGE | RANGE (AND SPECIFICATION WHERE APPROPRIATE) | BEST MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm) | REMARKS |
|---|---|---|----------------------------------|
| Temperature-Measure | -200 °C to 100 °C | 0.036 °C | Hart 1502A with 5699 RTD |
| | 100 °C to 660 °C | 0.061 °C | |
| Liquid-In-Glass Thermometers | -70 °C to 110 °C | 0.03 °C + 0.25 R | Liquid Bath and PRT |
| | 28 °C to 300 °C | 0.04 °C + 0.25 R | |
| IR Temperature-Measuring Equipment Blackbody Sources | 285 °C to 870 °C | 3.1 °C + 0.005 °C/°C | Blackbody Source, IR Thermometer |



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Time & Frequency

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|---|---|---|----------------|
| Frequency- Measuring Equipment | 0.01 Hz to 225 MHz | 2.5 μ Hz/Hz + 5 μ Hz | Agilent 53132A |
| Timers/Stopwatches | 5 s to 24 hr | 0.04 s | Agilent 53132A |

1. Remarks: This column shall include pertinent information about the calibration of the Measured Instrument or parameter. The information should include the type of standards used and any pertinent information about the measurement method. This column is not to be used for commercial advertisement of laboratory services.
2. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.