



## ANSI-ASQ National Accreditation Board

March 30, 2012

**VIA EMAIL**

Dwain Cox  
Tektronix Service Solutions  
4400-O Stuart Andrew Blvd.  
Charlotte, NC 28217

**Re: Extension for ISO/IEC 17025 accreditation**

Dear Dwain Cox:

This letter is to inform you that your accreditation for ISO/IEC 17025 will expire on April 8<sup>th</sup>, 2012. We have granted you an extension of 45 days from the expiration date on your certificate and scope of accreditation. If you have any questions or concerns regarding this matter, please feel free to give me a call at 703-836-0025 x-203.

Regards,

Keith Greenaway  
Vice President



**SCOPE OF ACCREDITATION TO  
ISO/IEC 17025:2005 & ANSI/NCSL Z540-1-1994**

**Tektronix Service Solutions**  
4400-0 Stuart Andrew Boulevard Charlotte, NC 28217  
Dwain Cox Phone: 704-527-5000

**CALIBRATION**

Valid to: April 8, 2012

Certificate Number: AC-1131

**I. Electromagnetic - DC/Low Frequency**

| <b>PARAMETER / EQUIPMENT</b> | <b>RANGE</b>  | <b>CALIBRATION &amp; MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]</b>  | <b>REFERENCE STANDARD OR EQUIPMENT</b>   | <b>METHOD(S)</b>                                   |
|------------------------------|---|---|--|--|
| DC Voltage - Source          | Up to 220 mV<br>220 mV to 2.2 V<br>(2.2 to 11) V<br>(11 to 22) V<br>(22 to 220) V<br>220 V to 1.1 kV<br>(1.1 to 10) kV        | 8 µV/V + 600 nV<br>7 µV/V + 1 µV<br>7 µV/V + 3.5 µV<br>7 µV/V + 6.5 µV<br>8 µV/V + 80 µV<br>9 µV/V + 500 µV<br>2.9 mV/V               | Fluke 5700A/5725A<br><br>Fluke 410B with<br>HP 3458A Opt 002                     | OEM and GIDEP<br>Sourced Calibration<br>Procedures |
| DC Voltage - Measure         | (10 to 100) mV<br>100 mV to 1 V<br>(1 to 10) V<br>(10 to 100) V<br>100 V to 1 kV<br>(1 to 10) kV<br><br>(10 to 120) kV        | 5.5 µV/V + 300 nV<br>5.1 µV/V + 300 nV<br>4.6 µV/V + 500 nV<br>6.5 µV/V + 30 µV<br>16.5 µV/V + 100 µV<br>116 µV/V<br><br>1mV/V        | HP 3458A Opt 002<br><br>Fluke 80E-10 with<br>HP 3458A Opt 002<br>Ross VD120-6.2Y |  |
| DC Current - Source          | Up to 220 µA<br>220 µA to 2.2 mA<br>(2.2 to 22) mA<br>(22 to 220) mA<br>220 mA to 2.2 A<br>(2.2 to 20) A<br><br>(20 to 100) A | 50 µA/A + 8 nA<br>50 µA/A + 8 nA<br>50 µA/A + 80 nA<br>60 µA/A + 800 nA<br>80 µA/A + 25 µA<br>257 µA/A + 4 mA<br><br>280 µA/A + 20 mA | Fluke 5700A/5725A<br><br>Ballantine<br>1620A Opt 04-60                           |  |
| DC Current - Measure         | (10 to 100) µA<br>100 µA to 1 mA<br>(1 to 10) mA<br>(10 to 100) mA<br>100 mA to 1 A<br>(1 to 20) A<br><br>(20 to 300) A       | 20 µA/A + 800 pA<br>20 µA/A + 5 nA<br>20 µA/A + 50 nA<br>35 µA/A + 500 nA<br>105 µA/A + 10 µA<br>120 µA/A<br><br>460 µA/A             | HP 3458A OPT 002<br><br>Fluke Y5020 with<br>HP 3458A Opt 002<br>L&N 4363         |  |



| PARAMETER / EQUIPMENT | RANGE   | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )]  | REFERENCE STANDARD OR EQUIPMENT | METHOD(S)                                    |
|-----------------------|---|--|---------------------------------|--|
| AC Voltage - Source   | <b>Up to 2.2 mV</b><br>(10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 20 kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 300) kHz<br>(300 to 500) kHz<br>500 kHz to 1 MHz   | 550 $\mu$ V/V + 4.5 $\mu$ V<br>210 $\mu$ V/V + 4.5 $\mu$ V<br>105 $\mu$ V/V + 4.5 $\mu$ V<br>370 $\mu$ V/V + 4.5 $\mu$ V<br>850 $\mu$ V/V + 7 $\mu$ V<br>1.1 mV/V + 13 $\mu$ V<br>1.7 mV/V + 25 $\mu$ V<br>3.4 mV/V + 25 $\mu$ V | Fluke 5700A/5725A               | OEM and GIDEP Sourced Calibration Procedures |
|                       | <b>(2.2 to 22) mV</b><br>(10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 20 kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 300) kHz<br>500 kHz to 1 MHz                     | 550 $\mu$ V/V + 5 $\mu$ V<br>210 $\mu$ V/V + 5 $\mu$ V<br>105 $\mu$ V/V + 5 $\mu$ V<br>370 $\mu$ V/V + 5 $\mu$ V<br>850 $\mu$ V/V + 7 $\mu$ V<br>1.1 mV/V + 12 $\mu$ V<br>3.4 mV/V + 25 $\mu$ V                                  |                                 |  |
|                       | <b>(22 to 220) mV</b><br>(10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 20 kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 300) kHz<br>(300 to 500) kHz<br>500 kHz to 1 MHz | 550 $\mu$ V/V + 13 $\mu$ V<br>210 $\mu$ V/V + 8 $\mu$ V<br>105 $\mu$ V/V + 8 $\mu$ V<br>320 $\mu$ V/V + 8 $\mu$ V<br>850 $\mu$ V/V + 25 $\mu$ V<br>1.1 mV/V + 25 $\mu$ V<br>1.7 mV/V + 35 $\mu$ V<br>3.4 mV/V + 80 $\mu$ V       |                                 |  |
|                       | <b>220 mV to 2.2 V</b><br>(10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 20 kHz   | 500 $\mu$ V/V + 80 $\mu$ V<br>160 $\mu$ V/V + 25 $\mu$ V<br>75 $\mu$ V/V + 6 $\mu$ V   |                                 |  |
|                       | <b>220 mV to 2.2 V</b><br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 300) kHz<br>(300 to 500) kHz<br>500 kHz to 1 MHz   | 120 $\mu$ V/V + 16 $\mu$ V<br>250 $\mu$ V/V + 70 $\mu$ V<br>430 $\mu$ V/V + 130 $\mu$ V<br>1.1 mV/V + 350 $\mu$ V<br>2.2 mV/V + 850 $\mu$ V  |                                 |  |
|                       | <b>(2.2 to 22) V</b><br>(10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 20 kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 300) kHz<br>(300 to 500) kHz<br>500 kHz to 1 MHz  | 500 $\mu$ V/V + 800 $\mu$ V<br>160 $\mu$ V/V + 250 $\mu$ V<br>75 $\mu$ V/V + 60 $\mu$ V<br>120 $\mu$ V/V + 160 $\mu$ V<br>250 $\mu$ V/V + 350 $\mu$ V<br>500 $\mu$ V/V + 1.5 mV<br>1.3 mV/V + 4.3 mV<br>2.7 mV/V + 8.5 mV        |                                 |  |



| PARAMETER / EQUIPMENT       | RANGE   | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )]   | REFERENCE STANDARD OR EQUIPMENT | METHOD(S)                                    |
|-----------------------------|---|---|---------------------------------|--|
| AC Voltage - Source (cont.) | <b>(22 to 220) V</b><br>(10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 20 kHz<br>(20 to 50) kHz<br>(50 to 100) kHz  | 500 $\mu$ V/V + 8 mV<br>160 $\mu$ V/V + 2.5 mV<br>80 $\mu$ V/V + 800 $\mu$ V<br>220 $\mu$ V/V + 3.5 mV<br>500 $\mu$ V/V + 8 mV  | Fluke 5700A/5725A               |  |
| AC Voltage - Measure        | <b>(1 to 10) mV</b><br>(1 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 20) kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 300) kHz<br>300 kHz to 1MHz<br>(1 to 4) MHz<br>(4 to 8) MHz<br><b>(10 to 100) mV</b><br>(1 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 20) kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 300) kHz<br>300 kHz to 1 MHz<br>(1 to 4) MHz<br>(4 to 8) MHz<br>(8 to 10) MHz<br><b>100 mV to 1 V</b><br>(1 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 20) kHz<br>(20 to 50) kHz<br>(50 to 100) kHz<br>(100 to 300) kHz<br>300 kHz to 1 MHz<br>(1 to 4) MHz<br>(4 to 8) MHz<br>(8 to 10) MHz | 300 $\mu$ V/V + 3 $\mu$ V<br>200 $\mu$ V/V + 1.1 $\mu$ V<br>300 $\mu$ V/V + 1.1 $\mu$ V<br>1 mV/V + 1.1 $\mu$ V<br>5 mV/V + 1.1 $\mu$ V<br>40 mV/V + 2 $\mu$ V<br>12 mV/V + 5 $\mu$ V<br>70 mV/V + 7 $\mu$ V<br>200 mV/V + 8 $\mu$ V<br><br>72 $\mu$ V/V + 4 $\mu$ V<br>72 $\mu$ V/V + 2 $\mu$ V<br>142 $\mu$ V/V + 2 $\mu$ V<br>302 $\mu$ V/V + 2 $\mu$ V<br>802 $\mu$ V/V + 2 $\mu$ V<br>30 mV/V + 10 $\mu$ V<br>10 mV/V + 10 $\mu$ V<br>15 mV/V + 10 $\mu$ V<br>40 mV/V + 8 $\mu$ V<br>150 mV/V + 100 $\mu$ V<br><br>72 $\mu$ V/V + 40 $\mu$ V<br>72 $\mu$ V/V + 20 $\mu$ V<br>142 $\mu$ V/V + 20 $\mu$ V<br>302 $\mu$ V/V + 20 $\mu$ V<br>802 $\mu$ V/V + 20 $\mu$ V<br>3 mV/V + 100 $\mu$ V<br>1 mV/V + 100 $\mu$ V<br>15 mV/V + 100 $\mu$ V<br>40 mV/V + 800 $\mu$ V<br>150 mV/V + 1 mV | HP 3458A Opt 002                | OEM and GIDEP Sourced Calibration Procedures |









| PARAMETER / EQUIPMENT                            | RANGE  | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]  | REFERENCE STANDARD OR EQUIPMENT | METHOD(S)                                    |
|--|--|--|---------------------------------|--|
| Resistance - Source                              | 1 Ω<br>1.9 Ω<br>10 Ω<br>19 Ω<br>100 Ω<br>190 Ω<br>1 kΩ<br>1.9 kΩ<br>10 kΩ<br>19 kΩ<br>100 kΩ<br>190 kΩ<br>1 MΩ<br>1.9 MΩ<br>10 MΩ<br>19 MΩ<br>100 MΩ | 95 μΩ<br>181 μΩ<br>280 μΩ<br>513 μΩ<br>1.7 mΩ<br>3.3 mΩ<br>13 mΩ<br>24.7 mΩ<br>120 mΩ<br>228 mΩ<br>1.4 Ω<br>2.7 Ω<br>20 Ω<br>40 Ω<br>400 Ω<br>893 Ω<br>11 kΩ | Fluke 5700A/5725A               |  |
| Electrical Simulation of Thermocouple Indicators |  |  |                                 | OEM and GIDEP Sourced Calibration Procedures |
| Type "B"   | (600 to 800) °C<br>(800 to 1 000) °C<br>(1 000 to 1 550) °C<br>(1 550 to 1 820) °C   | 0.51 °C<br>0.39 °C<br>0.35 °C<br>0.38 °C   |                                 |  |
| Type "C"   | (0 to 150) °C<br>(150 to 650) °C<br>(650 to 1 000) °C<br>(1 000 to 1 800) °C<br>(1 800 to 2 316) °C  | 0.35 °C<br>0.3 °C<br>0.36 °C<br>0.58 °C<br>0.97 °C   |                                 |  |
| Type "E"   | (-250 to -100) °C<br>(-100 to -25) °C<br>(-25 to 350) °C<br>(350 to 650) °C<br>(650 to 1 000) °C   | 0.58 °C<br>0.19 °C<br>0.16 °C<br>0.19 °C<br>0.24 °C  |                                 |  |
| Type "J"   | (-210 to -100) °C<br>(-100 to -30) °C<br>(-30 to 150) °C<br>(150 to 760) °C<br>(760 to 1 200) °C   | 0.32 °C<br>0.19 °C<br>0.17 °C<br>0.2 °C<br>0.27 °C   | Fluke 5500A-SC600               |  |



| PARAMETER / EQUIPMENT                                    | RANGE   | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)] | REFERENCE STANDARD OR EQUIPMENT | METHOD(S)                                    |  |  |
|--|---|---|---------------------------------|--|--|--|
| Electrical Simulation of Thermocouple Indicators (cont.) |   |   |                                 |  |  |  |
| Type "K"   | (-200 to -100) °C<br>(-100 to -25) °C<br>(-25 to 120) °C<br>(120 to 1 000) °C<br>(1 000 to 1 372) °C        | 0.38 °C<br>0.21 °C<br>0.19 °C<br>0.3 °C<br>0.46 °C                  | Fluke 5500A-SC600               | OEM and GIDEP Sourced Calibration Procedures |  |  |
| Type "L"   | (-200 to -100) °C<br>(-100 to 800) °C<br>(800 to 900) °C  | 0.43 °C<br>0.3 °C<br>0.2 °C   |                                 |  |  |  |
| Type "N"   | (-200 to -100) °C<br>(-100 to -25) °C<br>(-25 to 120) °C<br>(120 to 410) °C<br>(410 to 1 300) °C            | 0.46 °C<br>0.25 °C<br>0.22 °C<br>0.21 °C<br>0.31 °C                 |                                 |  |  |  |
| Type "R"   | (0 to 250) °C<br>(250 to 400) °C<br>(400 to 1 000) °C<br>(1 000 to 1 767) °C                                | 0.66 °C<br>0.4 °C<br>0.38 °C<br>0.46 °C                             |                                 |  |  |  |
| Type "S"   | (0 to 250) °C<br>(250 to 1 000) °C<br>(1 000 to 1 400) °C<br>(1 400 to 1 767) °C                            | 0.54 °C<br>0.42 °C<br>0.43 °C<br>0.53 °C                            |                                 |  |  |  |
| Type "T"   | (-250 to -150) °C<br>(-150 to 0) °C<br>(0 to 120) °C<br>(120 to 400) °C                                     | 0.73 °C<br>0.28 °C<br>0.19 °C<br>0.17 °C                            |                                 |  |  |  |
| Type "U"   | (-200 to 0) °C<br>(0 to 600) °C   | 0.65 °C<br>0.31 °C  |                                 |  |  |  |
| Electrical Simulation of RTDs Pt 385 (100 Ω)             | (-200 to 0) °C<br>(0 to 100) °C<br>(100 to 300) °C<br>(300 to 400) °C<br>(400 to 630) °C<br>(630 to 800) °C | 0.06 °C<br>0.08 °C<br>0.1 °C<br>0.12 °C<br>0.14 °C<br>0.27 °C       |                                 |  |  |  |

| PARAMETER / EQUIPMENT         | RANGE  | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]                            | REFERENCE STANDARD OR EQUIPMENT | METHOD(S)                                    |
|-------------------------------|--|--|---------------------------------|--|
| Electrical Simulation of RTDs |  |  |                                 |  |
| Pt 3926 (100 Ω)               | (-200 to 0) °C<br>(0 to 100) °C<br>(100 to 300) °C<br>(300 to 400) °C<br>(400 to 630) °C   | 0.06 °C<br>0.08 °C<br>0.1 °C<br>0.12 °C<br>0.14 °C   |                                 |  |
| Pt 3916 (100 Ω)               | (-200 to -190) °C<br>(-190 to -80) °C<br>(-80 to 0) °C<br>(0 to 100) °C<br>(100 to 260) °C<br>(260 to 300) °C<br>(300 to 400) °C<br>(400 to 600) °C<br>(600 to 630) °C | 0.29 °C<br>0.05 °C<br>0.06 °C<br>0.07 °C<br>0.08 °C<br>0.09 °C<br>0.1 °C<br>0.12 °C<br>0.27 °C |                                 |  |
| Pt 385 (200 Ω)                | (-200 to 100) °C<br>(100 to 260) °C<br>(260 to 300) °C<br>(300 to 400) °C<br>(400 to 600) °C<br>(600 to 630) °C  | 0.05 °C<br>0.06 °C<br>0.14 °C<br>0.15 °C<br>0.16 °C<br>0.18 °C                                 | Fluke 5500A-SC600               | OEM and GIDEP Sourced Calibration Procedures |
| Pt 385 (500 Ω)                | (-200 to -80) °C<br>(-80 to 100) °C<br>(100 to 260) °C<br>(260 to 400) °C<br>(400 to 600) °C<br>(600 to 630) °C  | 0.05 °C<br>0.06 °C<br>0.07 °C<br>0.09 °C<br>0.1 °C<br>0.13 °C                                  |                                 |  |
| Pt 385 (1 000 Ω)              | (-200 to 0) °C<br>(0 to 100) °C<br>(100 to 260) °C<br>(260 to 300) °C<br>(300 to 600) °C<br>(600 to 630) °C  | 0.03 °C<br>0.05 °C<br>0.06 °C<br>0.07 °C<br>0.08 °C<br>0.27 °C                                 |                                 |  |
| PtNi 385 (120 Ω)              | (-80 to 100) °C<br>(100 to 260) °C   | 0.09 °C<br>0.16 °C   |                                 |  |





| PARAMETER / EQUIPMENT  | RANGE   | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )]  | REFERENCE STANDARD OR EQUIPMENT | METHOD(S)                                    |
|--|---|--|---------------------------------|--|
| AC Power (45 to 65) Hz<br>Source PF=1<br>330 mV to 1 kV                                    | (3.3 to 9) mA<br>(9 to 33) mA<br>(33 to 90) mA<br>(90 to 330) mA<br>(330 to 900) mA<br>900 mA to 2.2 A<br>(2.2 to 4.5) A<br>(4.5 to 11) A | 2.5 mV/V of Watts Output<br>1.5 mV/V of Watts Output<br>2.5 mV/V of Watts Output<br>1.5 mV/V of Watts Output<br>2.5 mV/V of Watts Output<br>1.5 mV/V of Watts Output<br>2 mV/V of Watts Output<br>1.5 mV/V of Watts Output | Fluke 5520A-SC600               | OEM and GIDEP Sourced Calibration Procedures |
| Oscilloscopes<br>Amplitude<br>DC Signal<br>into 50 $\Omega$ Load<br>into 1 M $\Omega$ Load | (-6.6 to 6.6) V<br>(-130 to 130) V  | 2.5 mV/V + 40 $\mu$ V<br>500 $\mu$ V/V + 40 $\mu$ V  |                                 |  |
| Amplitude<br>Square wave<br>50 $\Omega$ Load   | 1 mV to 6.6 Vp-p<br>10 Hz to 10 kHz   | 2.5 mV/V + 40 $\mu$ V  |                                 |  |
| 1 M $\Omega$ Load  | 1 mV to 130 Vp-p<br>10 Hz to 1 kHz<br>(1 to 10) kHz   | 1 mV/V + 40 $\mu$ V<br>2.5 mV/V + 40 $\mu$ V   |                                 |  |
| Rise Time  | $\geq$ 300 ps   | + 0 ps/ -100ps   |                                 |  |
| Leveled Sine Wave - Flatness<br>Relative to 50 kHz<br>[5 mV to 5.5 V]                      | 50 kHz to 100 MHz<br>(100 to 300) MHz<br>(300 to 600) MHz   | 35 mV/V + 300 $\mu$ V<br>40 mV/V + 300 $\mu$ V<br>60 mV/V + 300 $\mu$ V  |                                 |  |
| Time Marker into<br>50 $\Omega$ Load-Source  | 5 s to 50 ms<br>20 ms to 2 ns   | (25 + 1 000t) parts in 10 <sup>6</sup><br>2.5 parts in 10 <sup>6</sup>   |                                 |  |
| Edge Specs into<br>50 $\Omega$ Load-Source   | 350 ps  | 0 ps /-100 ps  |                                 |  |
| Rise Time<br>Amplitude   | 5 mV to 2.5V  | 20 mV/V + 200 $\mu$ V  |                                 |  |
| Wave Generator - Source<br>Amplitude<br>(10 Hz to 10 kHz)                                  |   |  |                                 |  |
| Square, Sine, Triangle into 1 M $\Omega$   | 1.8 mV to 55 Vp-p   | 30 mV/V + 100 $\mu$ V  |                                 |  |
| Square, Sine, Triangle into 50 $\Omega$  | 1.8 mV to 2.5 Vp-p  | 30 mV/V + 100 $\mu$ V  |                                 |  |

## II. Time & Frequency

| PARAMETER / EQUIPMENT | RANGE   | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]   | REFERENCE STANDARD OR EQUIPMENT | METHOD(S)                                    |
|-----------------------|---|---|---------------------------------|--|
| Frequency - Source    | 10 MHz  | $5.77 \times 10^{10}$   | Datum 9390-6000                 | OEM and GIDEP Sourced Calibration Procedures |
|                       | 10 mHz to 120 Hz<br>120 Hz to 1.2 kHz<br>(1.2 to 12) kHz<br>(12 to 120) kHz<br>120 kHz to 1.2 MHz<br>(1.2 to 2) MHz | 25 μHz/Hz + 1 mHz<br>26 μHz/Hz + 1 mHz<br>27 μHz/Hz + 1 mHz<br>28 μHz/Hz + 15 mHz<br>29 μHz/Hz + 15 mHz<br>30 μHz/Hz + 15 mHz | Fluke 5500A-SC600               |  |
| Frequency - Measure   | DC to 225MHz  | $0.035 \times 10^8$   | HP 53131A Opt 010               |  |

## III. Thermodynamic

| PARAMETER / EQUIPMENT                       | RANGE                   | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)] | REFERENCE STANDARD OR EQUIPMENT                         | METHOD(S)                                    |
|---|-------------------------|---|---|--|
| Temperature - Measure                       | (-100 to -38.834) °C    | 0.011 °C  | Platinum Resistance Thermometers<br>Hart 5628 w/ 1529-R | OEM and GIDEP Sourced Calibration Procedures |
|   | (-38.834 to 0.01) °C    | 0.008 °C  |   |  |
| Infrared Non-contact                        | (0.01 to 156.6) °C      | 0.015 °C  | Hart 9132   |  |
|   | (156.6 to 231.928) °C   | 0.022 °C  |   |  |
| Relative Humidity<br>- Source*<br>- Measure | (231.928 to 419.527) °C | 0.029 °C  | Thunder Scientific 2500                                 |  |
|   | (419.527 to 660.323) °C | 0.031 °C  |   |  |
| Relative Humidity<br>- Source*<br>- Measure | (25 to 100) °C          | 0.7 °C  | Thunder Scientific 2500                                 |  |
|   | (100 to 300) °C         | 0.9 °C  |   |  |
|   | (300 to 400) °C         | 1 °C  |   |  |
| Relative Humidity<br>- Source*<br>- Measure | (10 to 95) %RH          | 0.35 %RH  | Thunder Scientific 2500                                 |  |
|   | (10 to 95) %RH          | 0.35 %RH  |   |  |

#### IV. Mechanical

| PARAMETER / EQUIPMENT   | RANGE   | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )]   | REFERENCE STANDARD OR EQUIPMENT   | METHOD(S)  |
|---|---|---|---|--|
| Sound Level Meters, Type 2<br>125 Hz<br>250 Hz<br>500 Hz<br>1 kHz<br>1 kHz<br>2 kHz | 114 dB<br>114 dB<br>114 dB<br>110 dB<br>114 dB<br>114 dB  | 0.42 dB<br>0.42 dB<br>0.42 dB<br>0.31 dB<br>0.42 dB<br>0.42 dB  | Genrad 1562-A<br>Genrad 1562-A<br>Genrad 1562-A<br>Quest CA-12<br>Genrad 1562-A<br>Genrad 1562-A  |  |
| Pressure  | (5 to 10) in H <sub>2</sub> O<br>(10 to 15) in H <sub>2</sub> O<br>(15 to 55) in H <sub>2</sub> O<br>(55 to 105) in H <sub>2</sub> O<br>(105 to 205) in H <sub>2</sub> O<br><br>(4 to 8) psi<br>(8 to 13) psi<br>(13 to 53) psi<br>(53 to 103) psi<br>(103 to 203) psi<br>(203 to 303) psi<br>(303 to 403) psi<br>(403 to 500) psi<br><br>(-30 to 0) in Hg<br>(0 to 500) psi<br>(0 to 500) psia<br><br>(500 to 1 200) psi<br>1 200 to 2 200 psi<br>2 200 to 4 200 psi<br>4 200 to 6 200 psi<br>6 200 to 10 000 psi<br><br>(1 to 3) in Hg<br>(3 to 11) in Hg<br>(11 to 30) in Hg | 0.002 in H <sub>2</sub> O<br>0.003 in H <sub>2</sub> O<br>0.011 in H <sub>2</sub> O<br>0.020 in H <sub>2</sub> O<br>0.039 in H <sub>2</sub> O<br><br>0.0015 psi<br>0.0024 psi<br>0.011 psi<br>0.021 psi<br>0.041 psi<br>0.061 psi<br>0.081 psi<br>0.1 psi<br><br>0.009 % of reading<br>0.009 % of reading<br>0.009 % of reading<br><br>0.24 psi<br>0.44 psi<br>0.84 psi<br>1.24 psi<br>2.0 psi<br><br>0.001 in Hg<br>0.002 in Hg<br>0.006 in Hg | Ruska T9000<br>Deadweight Tester<br><br>Ruska T3500/3<br>Deadweight Tester<br><br>Ruska 7250xi<br>Deadweight Tester<br><br>Ruska W2200/3<br>Deadweight Tester<br><br>Ruska T3500/3<br>Deadweight Tester | OEM and GIDEP<br>Sourced Calibration<br>Procedures |
| Force   | Up to 1 lb<br>(1 to 2) lb<br>(2 to 5) lb<br>(5 to 10) lb<br>(10 to 20) lb<br>(20 to 50) lb<br>(50 to 100) lb<br>(100 to 250) lb<br>(250 to 500) lb  | 0.001 lb<br>0.003 lb<br>0.006 lb<br>0.012 lb<br>0.026 lb<br>0.062 lb<br>0.124 lb<br>0.311 lb<br>0.622 lb  | Class F Weights   |  |

| PARAMETER / EQUIPMENT  | RANGE   | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )] | REFERENCE STANDARD OR EQUIPMENT                                      | METHOD(S)  |
|------------------------|---|---|--|--|
| Durometers             | Type A, B, and O<br>Type C, D, and DO   | 0.8 Duro<br>0.5 Duro  | Precision Scale or<br>Gage Blocks with<br>RDC-1 Durometer Calibrator | ASTM D2240-05                                      |
| Torque Tools           | (0.5 to 215) in-oz<br>4 in-lb to 1 000 ft-lb  | 0.8 % of reading<br>0.3 % of reading                                      | Waters Torque Calibrator<br>CDI Suretest                             | OEM and GIDEP<br>Sourced Calibration<br>Procedures |
| Torque Transducers     | (2.5 to 17.5) in-lb<br>(17.5 to 100) in-lb<br>(1 to 291) ft-lb                                    | 0.017 %<br>0.012 %<br>0.002 %   | Class 6 Weights  |  |
| Scales and Balances    | Up to 100 g<br>(100 to 200) g<br>(200 to 300) g<br>(300 to 500) g<br>500 g to 1 kg<br>(1 to 2) kg | 0.33 mg<br>0.34 mg<br>2.58 mg<br>2.59 mg<br>47.26 mg<br>32.68 mg          | Class 1 Weights  |  |
|                        | Up to 300 lb<br>(300 to 500) lb<br>(500 to 1 000) lb  | 0.03 lb<br>0.38 lb<br>0.52 lb   | Class F Weights  |  |
| Tachometer Testers     | (55 to 40 000) RPM  | 1.76 parts in $10^8$ Hz   | HP 53131A Opt 010  |  |
| Tachometers<br>Optical | (55 to 200 000) RPM   | 0.0012 %  | HP 3325B with LED  |  |
| Mechanical             | (55 to 100) RPM<br>(100 to 1 000) RPM<br>(1 000 to 30 000) RPM                                    | 0.023 %<br>0.015 %<br>0.006 %   | GEC H8224-837837   |  |

### V. Dimensional

| PARAMETER / EQUIPMENT | RANGE                       | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )] | REFERENCE STANDARD OR EQUIPMENT                | METHOD(S)  |
|-----------------------|-----------------------------|---|--|--|
| Micrometers           | (1 to 6) in<br>(6 to 48) in | (52.3 + 6.8L) $\mu$ in<br>(12.6 + 17.6L) $\mu$ in                         | Grade 1 or 2 Gage Blocks<br>with Optical Flats | OEM and GIDEP<br>Sourced Calibration<br>Procedures |
| Calipers              | (1 to 6) in<br>(6 to 48) in | (577.2 + 0.8L) $\mu$ in<br>(520.7 + 10.2L) $\mu$ in                       | Grade 1 or 2 Gage Blocks                       |  |

| PARAMETER / EQUIPMENT       | RANGE                                | CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )] | REFERENCE STANDARD OR EQUIPMENT          | METHOD(S)                                    |
|-----------------------------|--------------------------------------|---|--|--|
| Height Gages                | (1 to 6) in<br>(6 to 48) in          | (52.3 + 6.8L) $\mu$ in<br>(12.6 + 17.6L) $\mu$ in                         | Grade 1 or 2 Gage Blocks                 | OEM and GIDEP Sourced Calibration Procedures |
| Indicator Gages             | (1 to 6) in                          | (52.3 + 6.8L) $\mu$ in  |  |  |
| Pin & Plug Gages            | Up to 2 in                           | (46 + 5.5L) $\mu$ in  | Helios UMG50                             |  |
| Inside and Outside Diameter | Up to 12 in                          | (13 + 6.4L) $\mu$ in  | Federal 136B-3<br>w/ Grade 1 Gage Blocks |  |
| Surface Plate Flatness      | Up to 24 x 36 in<br>Up to 48 x 96 in | 63 $\mu$ in<br>85 $\mu$ in  | Rahn PlaneKator<br>Repeatometer          |  |
| Repeatability               |                                      | 28.5 $\mu$ in   |  |  |

**Notes:**

1. Calibration and Measurement Capabilities (CMC) (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of  $k=2$ .
2. This laboratory offers calibration services in its laboratory and on-site at customer-designated locations. Since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
3. CMC for Electromagnetic-DC/Low Frequency do not include possible contributions to uncertainty from a "best available" unit under test.
4. Capabilities denoted by an asterisk (\*) are in-laboratory only, not available for on-site calibration activity.
5. The use of (L) signifies an expression of Length in inches.
6. The use of (t) signifies an expression of Time in seconds.
7. This scope is part of and must be included with the Certificate of Accreditation No. AC-1131.




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Vice President