



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

**AppMet, Inc.**

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**CALIBRATION**

Valid to: December 6, 2010

Certificate Number: AC-1358

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

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Voltage - Source	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V 330 V to 1 kV	20 $\mu$ V/V + 1 $\mu$ V 11 $\mu$ V/V + 2 $\mu$ V 12 $\mu$ V/V + 20 $\mu$ V 18 $\mu$ V/V + 150 $\mu$ V 18 $\mu$ V/V + 1.5 mV		
AC Voltage - Source	<b>(1 to 33) mV</b> (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz <b>(33 to 330) mV</b> (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz <b>330 mV to 3.3 V</b> (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	800 $\mu$ V/V + 6 $\mu$ V 150 $\mu$ V/V + 6 $\mu$ V 200 $\mu$ V/V + 6 $\mu$ V 1 mV/V + 6 $\mu$ V 3.5 mV/V + 12 $\mu$ V 8 mV/V + 50 $\mu$ V  300 $\mu$ V/V + 8 $\mu$ V 145 $\mu$ V/V + 8 $\mu$ V 160 $\mu$ V/V + 8 $\mu$ V 350 $\mu$ V/V + 8 $\mu$ V 800 $\mu$ V/V + 32 $\mu$ V 2 mV/V + 70 $\mu$ V  300 $\mu$ V/V + 50 $\mu$ V 150 $\mu$ V/V + 60 $\mu$ V 190 $\mu$ V/V + 60 $\mu$ V 300 $\mu$ V/V + 50 $\mu$ V 70 $\mu$ V/V + 125 $\mu$ V 2.4 mV/V + 600 $\mu$ V	Fluke 5520A	GIDEP Sourced Procedures



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AC Voltage - Source (cont.)	<b>(3.3 to 33) V</b> (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) KHz (20 to 50) KHz (50 to 100) kHz <b>(33 to 330) V</b> 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz <b>330 V to 1.02 kV</b> 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	300 $\mu\text{V/V} + 650 \mu\text{V}$ 150 $\mu\text{V/V} + 600 \mu\text{V}$ 240 $\mu\text{V/V} + 600 \mu\text{V}$ 350 $\mu\text{V/V} + 600 \mu\text{V}$ 900 $\mu\text{V/V} + 1.6 \text{ mV}$  190 $\mu\text{V/V} + 2 \text{ mV}$ 200 $\mu\text{V/V} + 6 \text{ mV}$ 250 $\mu\text{V/V} + 6 \text{ mV}$ 300 $\mu\text{V/V} + 6 \text{ mV}$ 2 $\text{mV/V} + 50 \text{ mV}$  300 $\mu\text{V/V} + 10 \text{ mV}$ 250 $\mu\text{V/V} + 10 \text{ mV}$ 300 $\mu\text{V/V} + 10 \text{ mV}$	Fluke 5520A	GIDEP Sourced Procedures
DC Current - Source	Up to 330 $\mu\text{A}$ 330 $\mu\text{A}$ to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	150 $\mu\text{A/A} + 20 \text{ nA}$ 100 $\mu\text{A/A} + 50 \text{ nA}$ 100 $\mu\text{A/A} + 250 \text{ nA}$ 100 $\mu\text{A/A} + 2.5 \mu\text{A}$ 200 $\mu\text{A/A} + 40 \mu\text{A}$ 380 $\mu\text{A/A} + 40 \mu\text{A}$ 500 $\mu\text{A/A} + 500 \mu\text{A}$ 1 $\text{mA/A} + 750 \mu\text{A}$		
AC Current - Source	<b>(29 to 330) <math>\mu\text{A}</math></b> (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz <b>330 <math>\mu\text{A}</math> to 3.3 mA</b> (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	2 $\text{mA/A} + 100 \text{ nA}$ 1.5 $\text{mA/A} + 100 \text{ nA}$ 1.25 $\text{mA/A} + 100 \text{ nA}$ 3 $\text{mA/A} + 150 \text{ nA}$ 8 $\text{mA/A} + 200 \text{ nA}$  2 $\text{mA/A} + 150 \text{ nA}$ 1.25 $\text{mA/A} + 150 \text{ nA}$ 1 $\text{mA/A} + 150 \text{ nA}$ 2 $\text{mA/A} + 200 \text{ nA}$ 5 $\text{mA/A} + 300 \text{ nA}$		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Source (cont.)	<p><b>(3.3 to 33) mA</b>  (10 to 20) Hz  (20 to 45) Hz  45 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz</p> <p><b>(33 to 330) mA</b>  (10 to 20) Hz  (20 to 45) Hz  45 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz</p> <p><b>330 mA to 1.1 A</b>  (10 to 45) Hz  45 Hz to 1 kHz  (1 to 5) kHz</p> <p><b>(1.1 to 3) A</b>  (45 to 65) Hz  (65 to 500) Hz  500 Hz to 1 kHz</p> <p><b>(3 to 11) A</b>  (45 to 100) Hz  100 Hz to 1 kHz</p> <p><b>(11 to 20.5) A</b>  (45 to 100) Hz  100 Hz to 1 kHz</p>	<p>1.8 mA/A + 2 μA  900 μA/A + 2 μA  400 μA/A + 2 μA  800 μA/A + 2 μA  2 mA/A + 3 μA</p> <p>1.8 mA/A + 20 μA  900 μA/A + 20 μA  400 μA/A + 20 μA  1 mA/A + 50 μA  2 mA/A + 100 μA</p> <p>1.8 mA/A + 100 μA  500 μA/A + 100 μA  6 mA/A + 1 mA</p> <p>1.8 mA/A + 100 μA  600 μA/A + 100 μA  6 mA/A + 1 mA</p> <p>600 μA/A + 2 mA  1 mA/A + 2 mA</p> <p>1.2 mA/A + 5 mA  1.5 mA/A + 5 mA</p>	Fluke 5520A	GIDEP Sourced Procedures
Resistance - Source	<p>Up to 11 Ω  (11 to 33) Ω  (33 to 110) Ω  (110 to 330) Ω  330 Ω to 1.1 kΩ  (1.1 to 3.3) kΩ  (3.3 to 11) kΩ  (11 to 33) kΩ  (33 to 110) kΩ  (110 to 330) kΩ  330 kΩ to 1.1 MΩ  (1.1 to 3.3) MΩ  (3.3 to 11) MΩ  (11 to 33) MΩ  (33 to 110) MΩ  (110 to 330) MΩ</p>	<p>40 μΩ/Ω + 1 mΩ  30 μΩ/Ω + 1.5 mΩ  28 μΩ/Ω + 1.4 mΩ  28 μΩ/Ω + 2 mΩ  28 μΩ/Ω + 2 mΩ  28 μΩ/Ω + 20 mΩ  28 μΩ/Ω + 20 mΩ  28 μΩ/Ω + 200 mΩ  28 μΩ/Ω + 200 mΩ  32 μΩ/Ω + 2 Ω  32 μΩ/Ω + 2 Ω  60 μΩ/Ω + 30 Ω  130 μΩ/Ω + 50 Ω  250 μΩ/Ω + 2.5 kΩ  500 μΩ/Ω + 3 kΩ  3 mΩ/Ω + 100 kΩ</p>		



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Capacitance - Source	190 pF to 3.3 nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF 330 nF to 1.1 µF (1.1 to 3.3) µF (3.3 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF 330 µA to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	5 mF/F + 10 pF 2.5 mF/F + 10 pF 2.5 mF/F + 100 pF 2.5 mF/F + 300 pF 2.5 mF/F + 1 nF 2.5 mF/F + 3 nF 2.5 mF/F + 10 nF 4 mF/F + 30 nF 4.5 mF/F + 100 nF 4.5 mF/F + 300 nF 4.5 mF/F + 1 µF 4.5 mF/F + 3 µF 4.5 mF/F + 10 µF 7.5 mF/F + 30 µF 11 mF/F + 100 µF	Fluke 5520A	GIDEP Sourced Procedures
DC Voltage - Measure	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	9 µV/V + 300 nV 8 µV/V + 300 nV 8 µV/V + 500 nV 10 µV/V + 30 µV 10 µV/V + 100 µV	HP 3458A	
AC Voltage - Measure	<b>Up to 10 mV</b> (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz <b>(10 to 100) mV</b> (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	300 µV/V + 3 µV 200 µV/V + 1.1 µV 300 µV/V + 1.1 µV 1 mV/V + 1.1 µV 5 mV/V + 1.1 µV 40 mV/V + 2 µV  70 µV/V + 4 µV 70 µV/V + 2 µV 140 µV/V + 2 µV 300 µV/V + 2 µV 800 µV/V + 2 µV 3 mV/V + 10 µV 10 mV/V + 10 µV 15 mV/V + 10 µV		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure (cont.)	<b>100 mV to 1 V</b> (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz <b>(1 to 10) V</b> (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz <b>(10 to 100) V</b> (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz <b>100 V to 1 kV</b> (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	70 µV/V + 40 µV 70 µV/V + 20 µV 140 µV/V + 20 µV 300 µV/V + 20 µV 800 µV/V + 20 µV 3 mV/V + 100 µV 10 mV/V + 100 µV 15 mV/V + 100 µV  210 µV/V + 400 µV 100 µV/V + 200 µV 100 µV/V + 200 µV 300 µV/V + 200 µV 800 µV/V + 200 µV 3 mV/V + 1 mV 10 mV/V + 1 mV 15 mV/V + 1 mV  200 µV/V + 4 mV 200 µV/V + 2 mV 200 µV/V + 2 mV 350 µV/V + 2 mV 1.2 µV/V + 2 mV 4 mV/V + 10 mV 15 mV/V + 10 mV  400 µV/V + 40 mV 400 µV/V + 20 mV 600 µV/V + 20 mV 1.2 mV/V + 20 mV 3 mV/V + 20 mV	Fluke 5520A	GIDEP Sourced Procedures
DC Current - Measure	100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	30 µA/A + 40 nA 20 µA/A + 100 pA 20 µA/A + 800 pA 20 µA/A + 5 nA 20 µA/A + 500 nA 35 µA/A + 500 nA 110 µA/A + 10 µA	HP 3458A	



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AC Current - Measure	<p><b>Up to 100 µA</b>  (10 to 20) Hz  (20 to 45) Hz  (45 to 100) Hz  100 Hz to 1 kHz</p> <p><b>100 µA to 1 mA</b>  (10 to 20) Hz  (20 to 45) Hz  (45 to 100) Hz  100 Hz to 5 kHz  (5 to 20) kHz  (20 to 50) kHz  (50 to 100) kHz</p> <p><b>(1 to 10) mA</b>  (10 to 20) Hz  (20 to 45) Hz  (45 to 100) Hz  100 Hz to 5 kHz  (5 to 20) kHz  (20 to 50) kHz  (50 to 100) kHz</p> <p><b>(10 to 100) mA</b>  (10 to 20) Hz  (20 to 45) Hz  (45 to 100) Hz  100 Hz to 5 kHz  (5 to 20) kHz  (20 to 50) kHz  (50 to 100) kHz</p> <p><b>100 mA to 1 A</b>  (10 to 20) Hz  (20 to 45) Hz  (45 to 100) Hz  100 Hz to 5 kHz  (5 to 20) kHz  (20 to 50) kHz</p>	<p>4 mA/A + 300 nA  1.5 mA/A + 300 nA  600 µA/A + 300 nA  600 µA/A + 300 nA</p> <p>4 mA/A + 200 nA  1.5 mA/A + 200 nA  600 µA/A + 200 nA  600 µA/A + 200 nA  600 µA/A + 200 nA  4 mA/A + 400 nA  5.5 mA/A + 1.5 µA</p> <p>4 mA/A + 2 µA  1.5 mA/A + 2 µA  600 µA/A + 2 µA  600 µA/A + 2 µA  600 µA/A + 2 µA  4 mA/A + 4 µA  5.5 mA/A + 15 µA</p> <p>4 mA/A + 20 µA  1.5 mA/A + 20 µA  600 µA/A + 20 µA  600 µA/A + 20 µA  600 µA/A + 20 µA  4 mA/A + 40 µA  5.5 mA/A + 150 µA</p> <p>4 mA/A + 200 µA  1.6 mA/A + 200 µA  800 µA/A + 200 µA  1 mA/A + 200 µA  3 mA/A + 200 µA  10 mA/A + 400 µA</p>	HP 3458A	GIDEP Sourced Procedures



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Resistance - Measure	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ	15 μΩ/Ω + 50 μΩ 12 μΩ/Ω + 500 μΩ 10 μΩ/Ω + 500 μΩ 10 μΩ/Ω + 5 mΩ 10 μΩ/Ω + 50 mΩ 15 μΩ/Ω + 2 Ω 50 μΩ/Ω + 100 Ω 500 μΩ/Ω + 1 kΩ 5 mΩ/Ω + 10 kΩ	HP 3458A	GIDEP Sourced Procedures
Electrical Simulation of Thermocouples				
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C	0.63 °C 0.18 °C 0.18 °C 0.18 °C		
Type J	(650 to 1 000) °C (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C	0.18 °C 0.19 °C 0.18 °C 0.18 °C 0.18 °C		
Type K	(760 to 1 200) °C (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C	0.19 °C 1.14 °C 0.18 °C 0.18 °C 0.19 °C	Fluke 5520A	GIDEP Sourced or APPMET Procedures
Type R	(1 000 to 1 372) °C (0 to 250) °C (250 to 400) °C (400 to 1 000) °C	0.19 °C 0.27 °C 0.21 °C 0.21 °C		
Type S	(1 000 to 1 767) °C (0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C	0.22 °C 0.27 °C 0.21 °C 0.21 °C		
Type T	(1 400 to 1 767) °C (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.23 °C 0.34 °C 0.19 °C 0.18 °C 0.18 °C		

## II. Time & Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Stopwatch	Up to 30 hours	0.0075 % + 0.5 s	5245A	MET-SW-002
Frequency*	10 MHz	$3 \times 10^{-12}$ Hz	GPS Receiver	GIDEP Sourced Procedures

## III. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Measure	(-50 to 650) °C	0.06 °C	3458A, 1502, or 5520A	MET-TH-001
Relative Humidity	(0 to 100) % RH	1.04 %RH	Psychrometer	MET-RH-001

## IV. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pressure-Hydraulic	(2 to 10 000) psig	0.000175 <i>P</i> psi	Deadweight Tester	MET-PG-001
Pressure-Pneumatic	(-14.7 to 3) psig (3 to 500) psig	0.0226 psi (0.00256 + 0.00023 <i>P</i> ) psi	Deadweight Tester Pressure Module	GIDEP Sourced Procedures
Torque - Measure	Up to 250 ft lb (250 to 600) ft lb	0.87 % of reading 1.95 % of reading	Torque Calibrator	
Torque - Source	Up to 72 in lb (72 to 240) in lb (240 to 720) in lb (60 to 240) ft lb (240 to 720) ft lb	0.03 % of reading 0.01 % of reading 0.013 % of reading 0.013 % of reading 0.016 % of reading	6 in Torque Wheel and Class F Weights	MET-TQ-001

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Force*	Up to 250 lbf (250 to 25 000) lbf	0.001 lb + 0.6R 0.005 lb + 0.6R	Standard Weights and Load Cells	MET-FG-002
Gas Flow	Up to 250 ccm (0.25 to 6) lpm (6 to 30) lpm (30 to 1 000) lpm	3.8ccm 0.09 lpm 0.63 lpm 17.9 lpm	Bubble Generator  Laminar Flow Element	MET-AF-001
Hydraulic Flow	(0.2 to 5) gpm	0.26 gpm	Stopwatch/Prover	MET-LF-001
Scales	(0.1 to 10) lb (10 to 60) lb (60 to 250) lb	0.0022 lb 0.0066 lb 0.0113 lb	Class F Weights	GIDEP Sourced Procedures
Analytical Balance	Up to 100 g	0.22 mg	Class 1 Weights	
Surface Analyzers	(16 to 118) µin	3.7 µin	Roughness Standards	OEM Manuals


### V. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Micrometers – Outside - Inside	Up to 12 in (1.5 to 12) in	(112 + 13.8L) µin (132.2 + 7.3L) µin	Gage Blocks	GIDEP Sourced Procedures
Calipers	Up to 40 in	(661 + 11.7L) µin		
Height Gages	Up to 40 in	(371 + 1.3L) µin		
Indicator Calibrator	Up to 1 in	33 µin		MET-HG-001
Dial Comparator	Up to 0.002 in	15.1 µin		GIDEP Sourced Procedures
Depth Gages	Up to 12 in	(137.8 + 5.2L) µin		
Length Standards	Up to 28 in	(85.1 to 2.3L) µin	Gage Blocks and Analog Comparator	

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Cylindrical Plugs*	Up to 10 in	$(8.5 + 2.7L) \mu\text{in}$	Gage Blocks with ID/OD Comparator	
Cylindrical Rings*	(0.125 to 11) in	$(7.4 + 3.8L) \mu\text{in}$		
Dial Indicators	Up to 2 in	101.6 $\mu\text{in}$	Indicator Calibrator	

**Notes:**

1. Calibration and Measurement Capabilities (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of  $k=2$ .
2. This laboratory's capabilities include laboratory and on-site calibration services 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. Capabilities denoted with an asterisk (\*) are laboratory-only, not available for on-site calibration activity.
4. The use of (P) signifies Applied Pressure in psi.
5. The use of (R) signifies the Resolution of the device under test.
6. The use of (L) signifies Length in inches.
7. This scope is part of and must be included with the Certificate of Accreditation No. AC – 1358.




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Vice President

