



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

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**CALIBRATION**

Valid to: September 8, 2011

Certificate Number: AC-1187

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

<b>PARAMETER / EQUIPMENT</b>	<b>RANGE</b>	<b>CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]</b>	<b>REFERENCE STANDARD OR EQUIPMENT</b>	<b>METHOD(S)</b>
DC Voltage - Source  Fixed Point	Up to 220 mV (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV 10 V	6 μV/V + 400 nV 2.5 μV/V + 2.5 μV 2.5 μV/V + 4 μV 3.5 μV/V + 40 μV 4.5 μV/V + 400 μV 20 μV	Fluke 5720A Opt 03  Fluke 732B	OEM and GIDEP Sourced Calibration Procedures
DC Voltage - Measure	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V 200 V to 1 kV (1 to 60) kV	4.5 μV/V + 100 nV 3 μV/V + 400 nV 3 μV/V + 4 μV 4.5 μV/V + 40 μV 4.5 μV/V + 500 μV 1 mV/V	Fluke 8508A Opt 01  Ross VD60-6.2Y-A-LB-AL	
DC Current - Source	Up to 220 μA 220 μA to 2.2 mA (2.2 to 22) mA (22 to 220) mA  220 mA to 2.2 A	35 μA/A + 6 nA 30 μA/A + 7 nA 30 μA/A + 40 nA 40 μA/A + 700 nA [above 100 mA, add ± (200)(I <sup>2</sup> ) μA/A] 60 μA/A + 12 μA [above 1 A, add ± (10)(I <sup>2</sup> ) μA/A]	Fluke 5720A Opt 03	



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DC Current - Source (cont.)	(2.2 to 11) A (11 to 20.5) A	500 $\mu$ A/A + 500 $\mu$ A 1 mA/A + 750 $\mu$ A	Fluke 5520A	OEM and GIDEP Sourced Calibration Procedures
DC Current - Measure	(10 to 100) nA	30 $\mu$ A/A + 40 pA	HP 3458A Opt 002	
	100 nA to 1 $\mu$ A (1 to 10) $\mu$ A (10 to 100) $\mu$ A (100 to 200) $\mu$ A	15 $\mu$ A/A + 40 pA 15 $\mu$ A/A + 100 pA 15 $\mu$ A/A + 800 pA 12 $\mu$ A/A + 400 pA	Fluke 8508A Opt 01	
	200 $\mu$ A to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A (20 to 100) A (100 to 300) A	12 $\mu$ A/A + 4 nA 13 $\mu$ A/A + 40 nA 36 $\mu$ A/A + 800 nA 170 $\mu$ A/A + 16 $\mu$ A 380 $\mu$ A/A + 400 $\mu$ A 500 $\mu$ A/A 1 mA/A	Guildline 9211A	
Resistance - Source	1 $\Omega$	80 $\mu\Omega$	Fluke 5720A Opt 03	
	1.9 $\Omega$	152 $\mu\Omega$		
	10 $\Omega$	210 $\mu\Omega$		
	19 $\Omega$	399 $\mu\Omega$		
	100 $\Omega$	900 $\mu\Omega$		
	190 $\Omega$	1.71 m $\Omega$		
	1 k $\Omega$	7.5 m $\Omega$		
	1.9 k $\Omega$	14.25 m $\Omega$		
	10 k $\Omega$	75 m $\Omega$		
	19 k $\Omega$	142.5 m $\Omega$		
	100 k $\Omega$	900 m $\Omega$		
	190 k $\Omega$	1.71 $\Omega$		
	1 M $\Omega$	15 $\Omega$		
	1.9 M $\Omega$	30.4 $\Omega$		
	10 M $\Omega$	310 $\Omega$		
	19 M $\Omega$	741 $\Omega$		
100 M $\Omega$	9.5 k $\Omega$	Biddle 72-6346-1		
1 G $\Omega$	2 M $\Omega$			





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AC Voltage – Source (cont.)	<p><b>(22 to 220) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>220 mV to 2.2 V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(2.2 to 22) V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(22 to 220) V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>220 V to 1.1 kV</b></p> <p>(15 to 50) Hz 50 Hz to 1 kHz</p>	<p>220 μV/V + 12 μV 85 μV/V + 7 μV 75 μV/V + 7 μV 180 μV/V + 7 μV 420 μV/V + 17 μV 750 μV/V + 20 μV 1.2 mV/V + 25 μV 2.5 mV/V + 45 μV</p> <p>220 μV/V + 40 μV 80 μV/V + 15 μV 40 μV/V + 8 μV 70 μV/V + 10 μV 105 μV/V + 30 μV 340 μV/V + 80 μV 900 μV/V + 200 μV 1.5 mV/V + 300 μV</p> <p>220 μV/V + 400 μV 80 μV/V + 150 μV 40 μV/V + 50 μV 70 μV/V + 100 μV 95 μV/V + 200 μV 260 μV/V + 600 μV 900 μV/V + 2 mV 1.3 mV/V + 3.2 mV</p> <p>220 μV/V + 4 mV 80 μV/V + 1.5 mV 47 μV/V + 600 μV 75 μV/V + 1 mV 130 μV/V + 2.5 mV 800 μV/V + 16 mV 4.2 mV/V + 40 mV 7 mV/V + 80 mV</p> <p>260 μV/V + 16 mV 60 μV/V + 3.5 mV</p>	Fluke 5720A Opt 03	OEM and GIDEP Sourced Calibration Procedures

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure	<p><b>Up to 2.2 mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz (40 Hz to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(2.2 to 7) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(7 to 22) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(22 to 70) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p>	<p>1.7 mV/V + 1.3 <math>\mu</math>V 740 <math>\mu</math>V/V + 1.3<math>\mu</math>V 420 <math>\mu</math>V/V + 1.3<math>\mu</math>V 810 <math>\mu</math>V/V + 2 <math>\mu</math>V 1.2 mV/V + 2.5<math>\mu</math>V 2.3 mV/V + 4 <math>\mu</math>V 2.4 mV/V + 8 <math>\mu</math>V 3.5 mV/V + 8 <math>\mu</math>V</p> <p>850 <math>\mu</math>V/V + 1.3 <math>\mu</math>V 370 <math>\mu</math>V/V + 1.3<math>\mu</math>V 210 <math>\mu</math>V/V + 1.3<math>\mu</math>V 400 <math>\mu</math>V/V + 2 <math>\mu</math>V 600 <math>\mu</math>V/V + 2.5 <math>\mu</math>V 1.2 mV/V + 4 <math>\mu</math>V 1.3 mV/V + 8 <math>\mu</math>V 2.3 mV/V + 8 <math>\mu</math>V</p> <p>290 <math>\mu</math>V/V + 1.3 <math>\mu</math>V 190 <math>\mu</math>V/V + 1.3 <math>\mu</math>V 110 <math>\mu</math>V/V + 1.3 <math>\mu</math>V 210 <math>\mu</math>V/V + 2 <math>\mu</math>V 310 <math>\mu</math>V/V + 2.5 <math>\mu</math>V 810 <math>\mu</math>V/V + 4 <math>\mu</math>V 890 <math>\mu</math>V/V + 8 <math>\mu</math>V 1.7 mV/V + 8 <math>\mu</math>V</p> <p>240 <math>\mu</math>V/V + 1.5 <math>\mu</math>V 120 <math>\mu</math>V/V + 1.5 <math>\mu</math>V 65 <math>\mu</math>V/V + 1.5 <math>\mu</math>V 130 <math>\mu</math>V/V + 2 <math>\mu</math>V 260 <math>\mu</math>V/V + 2.5 <math>\mu</math>V 510 <math>\mu</math>V/V + 4 <math>\mu</math>V 670 <math>\mu</math>V/V + 8 <math>\mu</math>V 1.1 mV/V + 8 <math>\mu</math>V</p>	Fluke 5790A	OEM and GIDEP Sourced Calibration Procedures

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure (cont.)	<p><b>(70 to 220) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(220 to 700) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>700 mV to 2.2 V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(2.2 to 7) V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p>	<p>210 µV/V + 1.5 µV 85 µV/V + 1.5 µV 38 µV/V + 1.5 µV 69 µV/V + 2 µV 160 µV/V + 2.5 µV 250 µV/V + 4 µV 380 µV/V + 8 µV 1 mV/V + 8 µV</p> <p>210 µV/V + 1.5 µV 76 µV/V + 1.5 µV 33 µV/V + 1.5 µV 51 µV/V + 2 µV 79 µV/V + 2.5 µV 180 µV/V + 4 µV 300 µV/V + 8 µV 960 µV/V + 8 µV</p> <p>200 µV/V 66 µV/V 24 µV/V 46 µV/V 71 µV/V 160 µV/V 260 µV/V 900 µV/V</p> <p>200 µV/V 67 µV/V 24 µV/V 48 µV/V 81 µV/V 190 µV/V 400 µV/V 1.2 mV/V</p>	Fluke 5790A	OEM and GIDEP Sourced Calibration Procedures

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure (cont.)	<p><b>(7 to 22) V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(22 to 70) V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz</p> <p><b>(70 to 220) V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz</p> <p><b>(220 to 700) V</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz</p> <p><b>700 V to 1 kV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz</p>	<p>200 <math>\mu</math>V/V 67 <math>\mu</math>V/V 27 <math>\mu</math>V/V 48 <math>\mu</math>V/V 81 <math>\mu</math>V/V 190 <math>\mu</math>V/V 400 <math>\mu</math>V/V 1.2 mV/V</p> <p>200 <math>\mu</math>V/V 68 <math>\mu</math>V/V 32 <math>\mu</math>V/V 57 <math>\mu</math>V/V 94 <math>\mu</math>V/V 200 <math>\mu</math>V/V 410 <math>\mu</math>V/V 1.2 mV/V</p> <p>200 <math>\mu</math>V/V 68 <math>\mu</math>V/V 31 <math>\mu</math>V/V 69 <math>\mu</math>V/V 98 <math>\mu</math>V/V 210 <math>\mu</math>V/V 500 <math>\mu</math>V/V</p> <p>200 <math>\mu</math>V/V 99 <math>\mu</math>V/V 41 <math>\mu</math>V/V 130 <math>\mu</math>V/V 500 <math>\mu</math>V/V</p> <p>200 <math>\mu</math>V/V 99 <math>\mu</math>V/V 38 <math>\mu</math>V/V 130 <math>\mu</math>V/V 500 <math>\mu</math>V/V</p>	Fluke 5790A	OEM and GIDEP Sourced Calibration Procedures





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AC Voltage - Measure Flatness (cont.)	<b>(70 to 220) mV</b> (1 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz <b>(220 to 700) mV</b> (1 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz <b>700 mV to 2.2 V</b> (1 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz <b>(2.2 to 7) V</b> (1 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	500 $\mu$ V/V 1 mV/V 1.5 mV/V 3.5 mV/V  500 $\mu$ V/V 1 mV/V 1.5 mV/V 3.5 mV/V  500 $\mu$ V/V 1 mV/V 1.5 mV/V 3.5 mV/V  500 $\mu$ V/V 1 mV/V 1.5 mV/V 3.5 mV/V	Fluke 5790A Opt 03	OEM and GIDEP Sourced Calibration Procedures
AC Current - Source	<b>(9 to 220) <math>\mu</math>A</b> (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz <b>220 <math>\mu</math>A to 2.2 mA</b> (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz <b>(2.2 to 22) mA</b> (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	230 $\mu$ A/A + 16 nA 140 $\mu$ A/A + 10 nA 110 $\mu$ A/A + 8 nA 250 $\mu$ A/A + 12 nA 900 $\mu$ A/A + 65 nA  230 $\mu$ A/A + 40 nA 140 $\mu$ A/A + 35 nA 110 $\mu$ A/A + 35 nA 180 $\mu$ A/A + 110 nA 900 $\mu$ A/A + 650 nA  230 $\mu$ A/A + 400 nA 140 $\mu$ A/A + 350 nA 110 $\mu$ A/A + 350 nA 180 $\mu$ A/A + 550 nA 900 $\mu$ A/A + 5 $\mu$ A	Fluke 5720A Opt 03	

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AC Current - Source (cont.)	<p><b>(22 to 220) mA</b>  (10 to 20) Hz  (20 to 40) Hz  40 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz</p> <p><b>220 mA to 2.2 A</b>  20 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz</p> <p><b>(2.2 to 3) A</b>  (10 to 45) Hz  45 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz</p> <p><b>(3 to 11) A</b>  (45 to 100) Hz  100 Hz to 1 kHz  (1 to 5) kHz</p> <p><b>(11 to 20.5) A</b>  (45 to 100) Hz  100 Hz to 1 kHz  (1 to 5) kHz</p>	<p>230 <math>\mu</math>A/A + 4 <math>\mu</math>A  140 <math>\mu</math>A/A + 3.5 <math>\mu</math>A  110 <math>\mu</math>A/A + 2.5 <math>\mu</math>A  180 <math>\mu</math>A/A + 3.5 <math>\mu</math>A  900 <math>\mu</math>A/A + 10 <math>\mu</math>A</p> <p>240 <math>\mu</math>A/A + 35 <math>\mu</math>A  390 <math>\mu</math>A/A + 80 <math>\mu</math>A  6 000 <math>\mu</math>A/A + 160 <math>\mu</math>A</p> <p>1.8 mA/A + 100 <math>\mu</math>A  600 <math>\mu</math>A/A + 100 <math>\mu</math>A  6 mA/A + 1 mA  25 mA/A + 5 mA</p> <p>600 <math>\mu</math>A/A + 2 mA  1 mA/A + 2 mA  30 mA/A + 2 mA</p> <p>1.2 mA/A + 5 mA  1.5 mA/A + 5 mA  30 mA/A + 5 mA</p>	<p>Fluke 5720A Opt 03</p> <p>Fluke 5520A</p>	<p>OEM and GIDEP Sourced Calibration Procedures</p>
AC Current - Measure	<p><b>Up to 200 <math>\mu</math>A</b>  (1 to 10) Hz  10 Hz to 10 kHz  (10 to 30) kHz  (30 to 100) kHz</p> <p><b>200 <math>\mu</math>A to 2 mA</b>  (1 to 10) Hz  10 Hz to 10 kHz  (10 to 30) kHz  (30 to 100) kHz</p> <p><b>(2 to 20) mA</b>  (1 to 10) Hz  10 Hz to 10 kHz  (10 to 30) kHz  (30 to 100) kHz</p>	<p>475 <math>\mu</math>A/A + 20 nA  475 <math>\mu</math>A/A + 20 nA  650 <math>\mu</math>A/A + 20 nA  4 mA/A + 20 nA</p> <p>290 <math>\mu</math>A/A + 200 nA  280 <math>\mu</math>A/A + 200 nA  650 <math>\mu</math>A/A + 200 nA  4 mA/A + 200 nA</p> <p>290 <math>\mu</math>A/A + 2 <math>\mu</math>A  250 <math>\mu</math>A/A + 2 <math>\mu</math>A  650 <math>\mu</math>A/A + 2 <math>\mu</math>A  4 mA/A + 2 <math>\mu</math>A</p>	<p>Fluke 8508A Opt 01</p>	



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AC Current - Measure	<b>(20 to 200) mA</b> (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz <b>200 mA to 2 A</b> 10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz <b>(2 to 20) A</b> 10 Hz to 2 kHz (2 to 10) kHz  <b>20 mA to 2 A</b> 10 Hz to 100 kHz <b>(2 to 10) A</b> 10 Hz to 50 kHz	290 $\mu$ A/A + 20 $\mu$ A 250 $\mu$ A/A + 20 $\mu$ A 600 $\mu$ A/A + 20 $\mu$ A  600 $\mu$ A/A + 200 $\mu$ A 710 $\mu$ A/A + 200 $\mu$ A 3 mA/A + 200 $\mu$ A  800 $\mu$ A/A + 2 mA 2.5 mA/A + 2 mA  220 $\mu$ A/A  142 $\mu$ A/A	Fluke 8508A Opt 01    Fluke A40 Shunts with Fluke 5790A Opt 03	OEM and GIDEP Sourced Calibration Procedures
Electrical Simulation of Thermocouple Indicators			Fluke 5520A-SC1100	
Type B	(600 to 800) °C	0.44 °C		
	(800 to 1 000) °C	0.34 °C		
	(1 000 to 1 550) °C	0.30 °C		
Type C	(1 550 to 1 820) °C	0.33 °C		
	(0 to 150) °C	0.30 °C		
	(150 to 650) °C	0.26 °C		
	(650 to 1 000) °C	0.31 °C		
	(1 000 to 1 800) °C	0.50 °C		
Type E	(1 800 to 2 316) °C	0.84 °C		
	(-250 to -100) °C	0.50 °C		
	(-100 to -25) °C	0.16 °C		
	(-25 to 350) °C	0.14 °C		
	(350 to 650) °C	0.16 °C		
Type J	(650 to 1 000) °C	0.21 °C		
	(-210 to -100) °C	0.27 °C		
	(-100 to -30) °C	0.16 °C		
	(-30 to 150) °C	0.14 °C		
	(150 to 760) °C	0.17 °C		
	(760 to 1 200) °C	0.23 °C		

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Electrical Simulation of Thermocouple Indicators (cont.)			Fluke 5520A-SC1100	OEM and GIDEP Sourced Calibration Procedures
Type K	(-200 to -100) °C	0.33 °C		
	(-100 to -25) °C	0.18 °C		
	(-25 to 120) °C	0.16 °C		
	(120 to 1 000) °C	0.26 °C		
	(1 000 to 1 372) °C	0.40 °C		
Type L	(-200 to -100) °C	0.37 °C		
	(-100 to 800) °C	0.26 °C		
	(800 to 900) °C	0.17 °C		
Type N	(-200 to -100) °C	0.40 °C		
	(-100 to -25) °C	0.22 °C		
	(-25 to 120) °C	0.19 °C		
	(120 to 410) °C	0.18 °C		
	(410 to 1 300) °C	0.27 °C		
Type R	(0 to 250) °C	0.57 °C		
	(250 to 400) °C	0.35 °C		
	(400 to 1 000) °C	0.33 °C		
	(1 000 to 1 767) °C	0.40 °C		
Type S	(0 to 250) °C	0.47 °C		
	(250 to 1000) °C	0.36 °C		
	(1 000 to 1 400) °C	0.37 °C		
	(1 400 to 1 767) °C	0.46 °C		
Type T	(-250 to -150) °C	0.63 °C		
	(-150 to 0) °C	0.24 °C		
	(0 to 120) °C	0.16 °C		
	(120 to 400) °C	0.14 °C		
Type U	(-200 to 0) °C	0.56 °C		
	(0 to 600) °C	0.27 °C		
Electrical Simulation of RTDs Pt 395 (100 Ω)	(-200 to 0) °C	0.05 °C		
	(0 to 100) °C	0.07 °C		
	(100 to 300) °C	0.09 °C		
	(300 to 400) °C	0.10 °C		
	(400 to 630) °C	0.12 °C		
	(630 to 800) °C	0.23 °C		

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Electrical Simulation of RTDs			Fluke 5520A-SC1100	OEM and GIDEP Sourced Calibration Procedures
Pt 3926 (100 Ω)	(-200 to 0) °C	0.05 °C		
	(0 to 100) °C	0.07 °C		
	(100 to 300) °C	0.09 °C		
	(300 to 400) °C	0.10 °C		
	(400 to 630) °C	0.12 °C		
Pt 3916 (100 Ω)	(-200 to -190) °C	0.25 °C		
	(-190 to -80) °C	0.04 °C		
	(-80 to 0) °C	0.05 °C		
	(0 to 100) °C	0.06 °C		
	(100 to 260) °C	0.07 °C		
	(260 to 300) °C	0.08 °C		
	(300 to 400) °C	0.09 °C		
	(400 to 600) °C	0.10 °C		
	(600 to 630) °C	0.23 °C		
Pt 385 (200 Ω)	(-200 to 100) °C	0.04 °C		
	(100 to 260) °C	0.05 °C		
	(260 to 300) °C	0.12 °C		
	(300 to 400) °C	0.13 °C		
	(400 to 600) °C	0.14 °C		
	(600 to 630) °C	0.16 °C		
Pt 385 (500 Ω)	(-200 to -80) °C	0.04 °C		
	(-80 to 100) °C	0.05 °C		
	(100 to 260) °C	0.06 °C		
	(260 to 400) °C	0.08 °C		
	(400 to 600) °C	0.09 °C		
	(600 to 630) °C	0.11 °C		
Pt 385 (1 kΩ)	(-200 to 0) °C	0.03 °C		
	(0 to 100) °C	0.04 °C		
	(100 to 260) °C	0.05 °C		
	(260 to 300) °C	0.06 °C		
	(300 to 600) °C	0.07 °C		
	(600 to 630) °C	0.23 °C		
Ni 120 (120 Ω)	(-80 to 100) °C	0.08 °C		
	(100 to 260) °C	0.14 °C		
Cu 427 (10 Ω)	(-100 to 260) °C	0.3 °C		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Capacitance - Source 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 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 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	(190 to 400) pF 400 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 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 µF 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 5 mF/F + 10 pF 5 mF/F + 10 pF 2.5 mF/F + 10 pF 2.5 mF/F + 100 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-SC1100	OEM and GIDEP Sourced Calibration Procedures
Capacitance - Measure 10 Hz to 500 kHz	1 pF to 10 F	500 µF/F	Quadtech 7400	
Inductance - Measure 10 Hz to 500 KHz	1 pH to 10 H	500 µH/H		
DC Power - Source	<b>33 mV to 1 kV</b> 330 µA to 330 mA 330 mA to 3 A (3 to 20.5) A	0.02 % of Watts Output 0.02 % of Watts Output 0.06 % of Watts Output	Fluke 5520A-SC1100	OEM, GIDEP, and National Instruments Sourced Calibration Procedures
AC Power - Source (45 to 65) Hz	<b>(33 to 330) mV</b> (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 20.5) A	0.13 % of Watts Output 0.09 % of Watts Output 0.13 % of Watts Output 0.09 % of Watts Output 0.12 % of Watts Output 0.10 % of Watts Output 0.12 % of Watts Output 0.10 % of Watts Output		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Power - Source (45 to 65) Hz	<b>330 mV to 1 kV</b>  (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900mA to 3 A (3 to 11) A (11 to 20.5) A	0.11 % of Watts Output 0.07 % of Watts Output 0.11 % of Watts Output 0.07 % of Watts Output 0.10 % of Watts Output 0.08 % of Watts Output 0.11 % of Watts Output 0.09 % of Watts Output	Fluke 5520A-SC1100	OEM, GIDEP, and National Instruments Sourced Calibration Procedures
Calibration of Oscilloscopes Amplitude DC Signal 50 Ω Load 1 MΩ Load	(-6.6 to 6.6) V (-130 to 130) V	2.5 mV/V + 40 μV 500 μV/V + 40 μV		
Amplitude Squarewave 50 Ω Load 1 MΩ Load	10 Hz to 10 kHz ± 1 mV to ± 6.6 V p-p ± 1 mV to ± 130 V p-p	2.5 mV/V + 40 μV 1 mV/V + 40 μV		
Edge Specs into 50 Ω Load Rise Time Range (p-p)	≤ 300 ps 5 mV to 2.5 V	(0 /-100) ps 20 mV/V + 200 μV		
Leveled Sine Wave 50 kHz/10MHz (reference) [5 mV to 5.5 V] p-p 50 Ω Load	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz	35 mV/V + 300 μV 40 mV/V + 300 μV 60 mV/V + 300 μV 70 mV/V + 300 μV		
Time Marker into 50 Ω Load	5 s to 50 ms 20 ms to 1 ns	(25 + 1000t) μs/s 2.5 μs/s		
Wave Generator Amplitude Square, Sine, Triangle into 1 MΩ Square, Sine, Triangle into 50 Ω	(10 Hz to 100 kHz) 1.8 mV to 55 V p-p 1.8 mV to 2.5 V p-p	30 mV/V + 100 μV 30 mV/V + 100 μV		

## II. Electromagnetic - RF/Microwave

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY ( $\pm$ )]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
RF Power - Source 50 $\Omega$ load	<b>1 dB</b>			OEM and GIDEP Sourced Calibration Procedures
	1 mHz to 100 kHz	0.1 dB	HP 3325B	
	100 kHz to 20 MHz	0.4 dB		
	<b>(2 to 8) dB</b>			
	1 mHz to 100 Hz	0.2 dB		
	100 kHz to 10 MHz	0.5 dB		
	<b>(+10 to -127) dBm</b>			
	250 kHz to 2 GHz	0.5 dB	Agilent E4426B	
	(2 to 3) GHz	0.9 dB		
	(3 to 4) GHz	1.5 dB		
	<b>(+18 to +10) dBm</b>			
	(2.3 to 20) GHz	1.8 dB	HP 8340B	
	(20 to 26.5) GHz	2.3 dB		
	<b>(+10 to -10) dBm</b>			
	Up to 2.3 GHz	0.9 dB		
	(2.3 to 20) GHz	1.5 dB		
	(20 to 26.5) GHz	2 dB		
	<b>(-10 to -20) dBm</b>			
	Up to 2.3 GHz	1.2 dB		
	(2.3 to 20) GHz	2 dB		
(20 to 26.5) GHz	2.5 dB			
<b>(-20 to -50) dBm</b>				
Up to 2.3 GHz	1.5 dB			
(2.3 to 20) GHz	2.3 dB			
(20 to 26.5) GHz	2.8 dB			
<b>(-50 to -80) dBm</b>				
Up to 2.3 GHz	1.8 dB			
(2.3 to 20) GHz	2.6 dB			
(20 to 26.5) GHz	3.1 dB			
<b>(-80 to -100) dBm</b>				
Up to 2.3 GHz	2.1 dB			
(2.3 to 20) GHz	2.9 dB			
(20 to 26.5) GHz	3.4 dB			
<b>(-100 to -110) dBm</b>				
Up to 2.3 GHz	2.9 dB			
(2.3 to 20) GHz	3.7 dB			
(20 to 26.5) GHz	4.2 dB			

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
RF Power – Measure 50 Ω load (cont.)	<b>(+30 to -20) dBm</b> 100 kHz to 2 GHz (2 to 26.5) GHz <b>(+20 to -30) dBm</b> 110 kHz to 4.2 GHz 50 MHz to 26.5 GHz <b>(+10 to -20) dBm</b> 10 MHz to 2.6 GHz (2.6 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz <b>(+10 to +20) dBm</b> 10 MHz to 18 GHz (18 to 26.5) GHz <b>(-20 to -70) dBm</b> 10 MHz to 6 GHz (6 to 15) GHz (17 to 18) GHz <b>(-30 to +20) dBm</b> 100 kHz to 4.2 GHz	0.07 dBm 0.08 dBm 0.07 dBm 0.12 dBm 0.07 dBm 0.1 dBm 0.12 dBm 0.13 dBm 0.08 dBm 0.12 dBm 0.1 dBm 0.1 dBm 0.11 dBm 0.07 dBm	HP 8902 w/11722A HP 8902 w 11792A or 11793A  HP 438A w/8482A HP 438A w/8485A  HP 8902A w/ 11793A, 11722A, and 11792A  HP 436A w/ 8481A HP 436A w/ 8485A  HP 436A w/ 8481D  HP 436A w/ 8482A	OEM and GIDEP Sourced Calibration Procedures
Power Reference 1 mW	50 MHz	0.006 dB (3.4 μW)	HP 478-H76	
Phase Modulation - Measure Carrier Frequency: 150 kHz to 10 MHz 10 MHz to 26.5 GHz	200 Hz to 10 kHz 200 Hz to 20 kHz	5 % 4 %	HP 8902A w/ 11722A HP 8902A w/ 11793A	
Amplitude Modulation - Source Rate: 50 Hz to 10 kHz Depths: (5 to 99) % 20 Hz to 10 kHz Depths: to 99 % 50 Hz to 10 kHz Depths: (5 to 99) % 20 Hz to 10 kHz Depths: to 99 % 50 Hz to 10 kHz Depths: (5 to 99) %	100 MHz to 1.28 GHz 150 kHz to 10 MHz 150 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz	2.3 % 3.5 % 2.3 % 3.5 % 1.2 %	HP 8902A w/ 8662A HP 8902A w/ 11722A  HP 8902A w/ 11793A	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency Modulation - Source Modulation Rate: 20 Hz to 10 kHz 50 Hz to 100 kHz 20 Hz to 200 kHz	250 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz	2.4 % 1.3 % 5.8 %	HP 8902A Agilent E4426B	OEM, and GIDEP Sourced Calibration Procedures
Frequency Modulation - Measure Modulation Rate: 20 Hz to 10 kHz 50 Hz to 100 kHz 20 Hz to 200 kHz	250 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz	2.4 % 1.3 % 5.8 %	HP 8902A	
Insertion Loss- (0 to 110) dB	2.5 MHz to 26.5 GHz	0.13 dB	HP 8902A w/ 11793A, 11722A, and 11792A	
Distortion - Measure Fundamental Frequency	20 Hz to 20 kHz (20 to 100) kHz	1.19 dB 2.38 dB	HP 8903B	

### III. Time & Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency - Source	10 MHz DC to 225 MHz 225 MHz to 18 GHz	1.15 parts in 10 <sup>-9</sup> 1.15 parts in 10 <sup>-9</sup> 1.16 parts in 10 <sup>-9</sup>	Datum 9390-6000 HP 53132A HP 5342B	OEM and GIDEP Sourced Calibration Procedures
Frequency - Measure	10 MHz DC to 225 MHz 225 MHz to 18 GHz	1.15 parts in 10 <sup>-9</sup> 1.15 parts in 10 <sup>-9</sup> 1.16 parts in 10 <sup>-9</sup>	Datum 9390-6000 HP 53132A HP 5342B	

#### IV. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Source	(-30 to 231) °C	0.76 °C	T-100 PRT with F250 Thermometer and Well	OEM, GIDEP, NIST, and ASTM Sourced Calibration Procedures
Temperature - Measure	-39 °C	0.01 °C	T-100 PRT with F250 Precision thermometer	
	0.01 °C	0.01 °C		
	157 °C	0.01 °C		
	231 °C	0.01 °C		

#### V. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
*Single Axis Dimensional Gaging - Outside - Inside	Up to 11 in Up to 11.5 in	15.6 μin + 0.9L 15.8 μin + 0.9L	P&W Universal Supermicrometer	OEM and GIDEP Sourced Calibration Procedures
*Thread Plug Gage - Simple Pitch Diameter	Up to 11 in	26.9 μin + 0.9L	P&W Supermicrometer with Thread Wires	
*Thread Ring Gage- Simple Pitch Diameter	Up to 11 in	26.9 μin + 0.9L	Setting Plugs	
Micrometers	Up to 4 in (4 to 10) in (10 to 20) in (20 to 48) in	67 μin 105 μin 182 μin 832 μin	Grades 1 and 3 Gage Blocks with Optical Flats	
Calipers	Up to 6 in (6 to 20) in (20 to 48) in	128 μin 208 μin 737 μin	Grade 1 and 3 Gage Blocks	
Indicators	Up to 4 in	67 μin	Grade 1 Gage Blocks	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY (±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Height Gages	Up to 4 in (4 to 10) in (10 to 20) in (20 to 48) in	67 μin 105 μin 182 μin 730 μin	Grades 1 and 3 Gage Blocks with Surface Plate	OEM and GIDEP Sourced Calibration

**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's capabilities include in-laboratory and on-site calibration services. 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. Parameters denoted with an asterisk (\*) are not available for on-site calibrations.
4. CMC for Electromagnetic – DC/Low Frequency and RF/Microwave parameters do not include possible contributions to uncertainty from a "best available" unit under test.
5. CMC for RF/Microwave do not include possible contributions from mismatch error.
6. The use of (I) denotes Applied Current.
7. The use of (L) signifies an expression of Length in inches.
8. The use of (t) stands for Time in seconds.
9. This scope is part of and must be included with the Certificate of Accreditation No. AC-1187.




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Vice-President

