



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

**Onsite Calibration Service, Inc.**

308 New Venture Drive Louisville, KY 40214  
Kevin Perkins Phone: 502-361-9544

**CALIBRATION**

Valid to: June 13, 2013

Certificate Number: AC-1398

**I. Electromagnetic - DC/Low Frequency<sup>7</sup>**

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Voltage - Source <sup>3</sup>	Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	7.5 µV/V + 400 nV 5 µV/V + 700 nV 3.5 µV/V + 2.5 µV 3.5 µV/V + 4 µV 5 µV/V + 40 µV 6.5 µV/V + 400 µV	Fluke 5720A Opt 3 (5700A/EP Opt 3)	OEM and GIDEP Sourced Procedures
High Voltage	10 V  (1 to 3) kV (3 to 7.5) kV (7.5 to 15) kV (15 to 21) kV (21 to 30) kV	4 µV  3.46 V 8.66 V 17.4 V 24.2 V 34.6 V	Fluke 732A  Ross Engineering VD30 Agilent 34401A Spellman PTV70P200	
DC Voltage - Measure <sup>3</sup>	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V 200 V to 1.05 kV	5 µV/V + 100 nV 3.5 µV/V + 400 nV 3.5 µV/V + 4 µV 5.5 µV/V + 40 µV 5.5 µV/V + 5 µV	Fluke 8508A	
High Voltage	(1 to 3) kV (3 to 7.5) kV (7.5 to 15) kV (15 to 21) kV (21 to 30) kV	3.46 V 8.66 V 17.4 V 24.2 V 34.6 V	Ross Engineering VD30 Agilent 34401A	





PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Resistance - Measure <sup>3</sup> Normal Mode	Up to 2 Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ	17 μΩ/Ω + 4 μΩ 9.5 μΩ/Ω + 14 μΩ 8 μΩ/Ω + 50 μΩ 8 μΩ/Ω + 500 μΩ 8 μΩ/Ω + 5 mΩ 8 μΩ/Ω + 50 mΩ 9 μΩ/Ω + 1 Ω 20 μΩ/Ω + 100 Ω 120 μΩ/Ω + 10 kΩ 1.51 mΩ/Ω + 1 MΩ	Fluke 8508A	
High Voltage Mode	(2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ (2 to 20) GΩ	17 μΩ/Ω + 10 Ω 65 μΩ/Ω + 1 kΩ 180 μΩ/Ω + 100 kΩ 15.1 mΩ/Ω + 10 MΩ		
AC Voltage - Source <sup>3</sup>	<b>Up to 2.2 mV</b> (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 500kHz to 1 MHz <b>(2.2 to 22) mV</b> (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 500kHz to 1 MHz <b>(22 to 220) mV</b> (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 500kHz to 1 MHz	240 μV/V + 4 μV 90 μV/V + 4 μV 80 μV/V + 4 μV 200 μV/V + 4 μV 500 μV/V + 5 μV 1.05 mV/V + 10 μV 1.4 mV/V + 20 μV 2.7 mV/V + 20 μV  240 μV/V + 4 μV 90 μV/V + 4 μV 80 μV/V + 4 μV 200 μV/V + 4 μV 500 μV/V + 5 μV 1.05 mV/V + 10 μV 1.4 mV/V + 20 μV 2.7 mV/V + 20 μV  240 μV/V + 12 μV 90 μV/V + 7 μV 80 μV/V + 7 μV 200 μV/V + 7 μV 460 μV/V + 17 μV 900 μV/V + 20 μV 1.4 mV/V + 25 μV 2.7 mV/V + 45 μV	Fluke 5720A Opt 3 (5700A/EP Opt 3)	OEM and GIDEP Sourced Procedures



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AC Voltage - Source <sup>3</sup> (cont.) Wide Band Option Flatness (1 kHz Ref)	<b>300 μV to 1.1 mV</b> (10 to 30) Hz 30 Hz to 120 kHz 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz <b>(1.1 to 3) mV</b> (10 to 30) Hz 30 Hz to 120 kHz 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz <b>3 mV to 3.5 V</b> (10 to 30) Hz 30 Hz to 120 kHz 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	3 mV/V 1 mV/V 2 mV/V + 3 μV 4 mV/V + 3 μV 6 mV/V + 3 μV 105 mV/V + 15 μV  3 mV/V 1 mV/V 1 mV/V + 3 μV 3 mV/V + 3 μV 5 mV/V + 3 μV 105 mV/V + 3 μV  3 mV/V 1 mV/V 1 mV/V + 3 μV 2 mV/V + 3 μV 4 mV/V + 3 μV 100 mV/V + 3 μV	Fluke 5720A Opt 3 (5700A/EP Opt 3)	OEM and GIDEP Sourced Procedures
AC Voltage - Measure <sup>3</sup>	<b>Up to 200 mV</b> (1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz <b>200 mV to 2 V</b> (1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	165 μV/V + 14 μV 140 μV/V + 4 μV 115 μV/V + 4 μV 110 μV/V + 2 μV 135 μV/V + 4 μV 340 μV/V + 8 μV 765 μV/V + 20 μV  150 μV/V + 120 μV 115 μV/V + 20 μV 90 μV/V + 20 μV 75 μV/V + 20 μV 110 μV/V + 20 μV 220 μV/V + 840 μV 570 μV/V + 200 μV 3 mV/V + 2 mV 10 mV/V + 2 mV	Fluke 8508A	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure <sup>3</sup> Flatness (Relative to 1 kHz) (cont.)	<p><b>(2.2 to 7) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (10 to 30) Hz 30 Hz to 120 kHz 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz</p> <p><b>(7 to 22) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (10 to 30) Hz 30 Hz to 120 kHz 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz</p> <p><b>(22 to 70) mV</b></p> <p>(10 to 20) Hz (20 to 40) Hz 40 to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (10 to 30) Hz 30 Hz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz</p>	<p>850 <math>\mu\text{V}/\text{V} + 1.3 \mu\text{V}</math> 370 <math>\mu\text{V}/\text{V} + 1.3 \mu\text{V}</math> 210 <math>\mu\text{V}/\text{V} + 1.3 \mu\text{V}</math> 400 <math>\mu\text{V}/\text{V} + 2 \mu\text{V}</math> 600 <math>\mu\text{V}/\text{V} + 2.5 \mu\text{V}</math> 1.2 <math>\text{mV}/\text{V} + 4 \mu\text{V}</math> 1.3 <math>\text{mV}/\text{V} + 8 \mu\text{V}</math> 2.3 <math>\text{mV}/\text{V} + 8 \mu\text{V}</math> 1 <math>\text{mV}/\text{V}</math> 500 <math>\mu\text{V}/\text{V}</math> 700 <math>\mu\text{V}/\text{V} + 1 \mu\text{V}</math> 1 <math>\text{mV}/\text{V} + 1 \mu\text{V}</math> 1.7 <math>\text{mV}/\text{V} + 1 \mu\text{V}</math> 3.7 <math>\text{mV}/\text{V} + 1 \mu\text{V}</math></p> <p>290 <math>\mu\text{V}/\text{V} + 1.3 \mu\text{V}</math> 190 <math>\mu\text{V}/\text{V} + 1.3 \mu\text{V}</math> 110 <math>\mu\text{V}/\text{V} + 1.3 \mu\text{V}</math> 210 <math>\mu\text{V}/\text{V} + 2 \mu\text{V}</math> 310 <math>\mu\text{V}/\text{V} + 2.5 \mu\text{V}</math> 810 <math>\mu\text{V}/\text{V} + 4 \mu\text{V}</math> 890 <math>\mu\text{V}/\text{V} + 8 \mu\text{V}</math> 1.7 <math>\text{mV}/\text{V} + 8 \mu\text{V}</math> 1 <math>\text{mV}/\text{V}</math> 500 <math>\mu\text{V}/\text{V}</math> 700 <math>\mu\text{V}/\text{V}</math> 1 <math>\text{mV}/\text{V}</math> 1.7 <math>\text{mV}/\text{V}</math> 3.7 <math>\text{mV}/\text{V}</math></p> <p>240 <math>\mu\text{V}/\text{V} + 1.5 \mu\text{V}</math> 120 <math>\mu\text{V}/\text{V} + 1.5 \mu\text{V}</math> 65 <math>\mu\text{V}/\text{V} + 1.5 \mu\text{V}</math> 130 <math>\mu\text{V}/\text{V} + 2 \mu\text{V}</math> 260 <math>\mu\text{V}/\text{V} + 2.5 \mu\text{V}</math> 510 <math>\mu\text{V}/\text{V} + 4 \mu\text{V}</math> 670 <math>\mu\text{V}/\text{V} + 8 \mu\text{V}</math> 1.1 <math>\text{mV}/\text{V} + 8 \mu\text{V}</math> 1 <math>\text{mV}/\text{V}</math> 500 <math>\mu\text{V}/\text{V}</math> 1 <math>\text{mV}/\text{V}</math> 1.5 <math>\text{mV}/\text{V}</math> 3.5 <math>\text{mV}/\text{V}</math></p>	Fluke 5790A/3	OEM and GIDEP Sourced Procedures

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AC Voltage - Measure <sup>3</sup> Flatness (Relative to 1 kHz) (cont.)	<b>(70 to 220) mV</b>			
	(10 to 20) Hz	210 µV/V + 1.5 µV		
	(20 to 40) Hz	85 µV/V + 1.5 µV		
	40 to 20 kHz	38 µV/V + 1.5 µV		
	(20 to 50) kHz	69 µV/V + 2 µV		
	(50 to 100) kHz	160 µV/V + 2.5 µV		
	(100 to 300) kHz	250 µV/V + 4 µV		
	(300 to 500) kHz	380 µV/V + 8 µV		
	500 kHz to 1 MHz	1 mV/V + 8 µV		
	(10 to 30) Hz	1 mV/V		
	30 Hz to 500 kHz	400 µV/V		
	500 kHz to 2 MHz	500 µV/V		
	(2 to 10) MHz	1 mV/V		
	(10 to 20) MHz	1.5 mV/V		
	(20 to 30) MHz	3.5 mV/V		
	<b>(220 to 700) mV</b>			
	(10 to 20) Hz	210 µV/V + 1.5 µV		
	(20 to 40) Hz	76 µV/V + 1.5 µV		
	40 to 20 kHz	33 µV/V + 1.5 µV		
	(20 to 50) kHz	51 µV/V + 2 µV		
	(50 to 100) kHz	79 µV/V + 2.5 µV		
	(100 to 300) kHz	180 µV/V + 4 µV		
	(300 to 500) kHz	300 µV/V + 8 µV		
	500 kHz to 1 MHz	960 µV/V + 8 µV		
	(10 to 30) Hz	1 mV/V		
	30 Hz to 500 kHz	300 µV/V		
	500 kHz to 2 MHz	500 µV/V		
	(2 to 10) MHz	1 mV/V		
	(10 to 20) MHz	1.5 mV/V		
	(20 to 30) MHz	3.5 mV/V		
	<b>700 mV to 2.2 V</b>			
	(10 to 20) Hz	200 µV/V		
	(20 to 40) Hz	66 µV/V		
	40 to 20 kHz	24 µV/V		
	(20 to 50) kHz	46 µV/V		
	(50 to 100) kHz	71 µV/V		
	(100 to 300) kHz	160 µV/V		
	(300 to 500) kHz	260 µV/V		
	500 kHz to 1 MHz	900 µV/V		
	(10 to 30) Hz	1 mV/V		
30 Hz to 500 kHz	300 µV/V			
500 kHz to 2 MHz	500 µV/V			
(2 to 10) MHz	1 mV/V			
(10 to 20) MHz	1.5 mV/V			
(20 to 30) MHz	3.5 mV/V			

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AC Voltage - Measure <sup>3</sup> (Relative to 1 kHz) (cont.)	<b>(2.2 to 7) V</b>		Fluke 5790A/3	OEM and GIDEP Sourced Procedures
	(10 to 20) Hz	200 µV/V		
	(20 to 40) Hz	67 µV/V		
	40 to 20 kHz	24 µV/V		
	(20 to 50) kHz	48 µV/V		
	(50 to 100) kHz	71 µV/V		
	(100 to 300) kHz	190 µV/V		
	(300 to 500) kHz	400 µV/V		
	500 kHz to 1 MHz	1.2 mV/V		
	(10 to 30) Hz	1 mV/V		
	30 Hz to 500 kHz	300 µV/V		
	500 kHz to 2 MHz	500 µV/V		
	(2 to 10) MHz	1 mV/V		
	(10 to 20) MHz	1.5 mV/V		
	(20 to 30) MHz	3.5 mV/V		
	<b>(7 to 22) V</b>			
	(10 to 20) Hz	200 µV/V		
	(20 to 40) Hz	67 µV/V		
	40 to 20 kHz	27 µV/V		
	(20 to 50) kHz	48 µV/V		
	(50 to 100) kHz	81 µV/V		
	(100 to 300) kHz	190 µV/V		
	(300 to 500) kHz	400 µV/V		
	500 kHz to 1 MHz	1.2 mV/V		
	<b>(22 to 70) V</b>			
	(10 to 20) Hz	200 µV/V		
	(20 to 40) Hz	68 µV/V		
	40 to 20 kHz	32 µV/V		
	(20 to 50) kHz	57 µV/V		
	(50 to 100) kHz	94 µV/V		
	(100 to 300) kHz	200 µV/V		
	(300 to 500) kHz	410 µV/V		
	500 kHz to 1 MHz	1.2 mV/V		
	<b>(70 to 220) V</b>			
	(10 to 20) Hz	200 µV/V		
	(20 to 40) Hz	68 µV/V		
40 to 20 kHz	31 µV/V			
(20 to 50) kHz	69 µV/V			
(50 to 100) kHz	98 µV/V			
(100 to 300) kHz	210 µV/V			
(300 to 500) kHz	500 µV/V			





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AC Current - Measure <sup>3</sup> (cont.)	<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	310 μA/A + 20 μA 300 μA/A + 20 μA 625 μA/A + 20 μA  620 μA/A + 200 μA 725 μA/A + 200 μA 3 mA/A + 200 μA  820 μA/A + 2 mA 2.5 mA/A + 2 mA	Fluke 8508A	
Electrical Simulation of Thermocouple Indicators <sup>3</sup>	<b>Type E</b> (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C <b>Type J</b> (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C <b>Type K</b> (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C <b>Type R</b> (0 to 250) °C (250 to 400) °C (400 to 1 000) °C (1 000 to 1 767) °C <b>Type S</b> (0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C <b>Type T</b> (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.5 °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 0.4 °C  0.57 °C 0.35 °C 0.33 °C 0.4 °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	Fluke 5520A	OEM and GIDEP Sourced Procedures

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of RTDs <sup>3</sup>	<b>Pt 395, 100 Ω</b>		Fluke 5520A	OEM and GIDEP Sourced Procedures
	(-200 to -80) °C	0.05 °C		
	(-80 to 0) °C	0.05 °C		
	(0 to 100) °C	0.07 °C		
	(100 to 300) °C	0.09 °C		
	(300 to 400) °C	0.1 °C		
	(400 to 630) °C	0.12 °C		
	(630 to 800) °C	0.23 °C		
	<b>Pt 3926, 100 Ω</b>			
	(-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	0.1 °C		
	(400 to 630) °C	0.12 °C		
	<b>Pt 3916, 100 Ω</b>			
	(-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	0.1 °C		
	(600 to 630) °C	0.23 °C		
	<b>Pt 385, 200 Ω</b>			
	(-200 to -80) °C	0.04 °C		
	(-80 to 0) °C	0.04 °C		
	(0 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			
<b>Pt 385, 500 Ω</b>				
(-200 to -80) °C	0.04 °C			
(-80 to 0) °C	0.05 °C			
(0 to 100) °C	0.05 °C			
(100 to 260) °C	0.06 °C			
(260 to 300) °C	0.08 °C			
(300 to 400) °C	0.08 °C			
(400 to 600) °C	0.09 °C			
(600 to 630) °C	0.11 °C			



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Electrical Simulation of RTDs <sup>3</sup> (cont.)	<b>Pt 385, 1 kΩ</b>		Fluke 5520A	OEM and GIDEP Sourced Procedures
	(-200 to -80) °C	0.03 °C		
	(-80 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 400) °C	0.07 °C		
	(400 to 600) °C	0.07 °C		
	(600 to 630) °C	0.23 °C		
	<b>PtNi 385, 120 Ω</b>			
(-80 to 0) °C	0.08 °C			
(0 to 100) °C	0.08 °C			
(100 to 260) °C	0.14 °C			
<b>Cu 427, 10 Ω</b>				
(-100 to 260) °C	0.3°C			
DC Power - Source <sup>3</sup> 33 mV to 1.02 kV	330 μA to 330 mA	0.02 %	Fluke 5520A	OEM and GIDEP Sourced Procedures
	330 mA to 3 A	0.02 %		
	(3 to 20.5) A	0.07 %		
AC Power - Source <sup>3</sup> (45 to 65) Hz	<b>(33 to 330) mV</b>		Fluke 5520A	OEM and GIDEP Sourced Procedures
	(3.3 to 9) mA	0.14 %		
	(9 to 33) mA	0.1 %		
	(33 to 90) mA	0.14 %		
	(90 to 330) mA	0.1 %		
	(330 to 900) mA	0.13 %		
	900 mA to 2.2) A	0.11 %		
	(2.2 to 5) A	0.13 %		
	(5 to 20.5) A	0.11 %		
	<b>330 mV to 1.02 kV</b>			
	(3.3 to 9) mA	0.12 %		
	(9 to 33) mA	0.08 %		
	(33 to 90) mA	0.12 %		
	(90 to 330) mA	0.08 %		
	(330 to 900) mA	0.11 %		
	900 mA to 2.2 A	0.09 %		
	(2.2 to 5) A	0.12 %		
(5 to 20.5) A	0.1 %			

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<b>Oscilloscopes<sup>3,6</sup></b> DC Voltage (50Ω) DC Voltage (1MΩ) Amplitude Square Wave (50 Ω) (1 MΩ) Leveled Sine Wave - Flatness 50 Ω (Relative to 50 kHz) 5 mV to 5.5 V Time Markers into 50 Ω Wave Generator - Source Amplitude Square, Sine, Triangle into 1 MΩ Square, Sine, Triangle into 50 Ω Pulse Generator Width into 50 Ω Pulse Generator Period into 50 Ω Rise Time 50 Ω Amplitude (Peak to Peak) Frequency	-6.6 V to 6.6 V -130 V to 130 V ±1 mV to ±6.6 V p-p 10 Hz to 10 kHz ±1 mV to ±130 V p-p 10 Hz to 1kHz (1 to 10) kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 5 s to 50 ms 20 ms to 2 ns 1.8 mV to 55 V p-p 1.8 mV to 2.5 V p-p (4 to 44.9) ns (45 to 500) ns 200 ns to 20 ms ≤350 ps 5.0 mV to 2.5 V 1 kHz to 10 MHz	2.5 mV/V + 40 μV 500 μV/V + 40 μV 2.5 mV/V + 40 μV 1 mV/V + 40 μV 2.5 mV/V + 40 μV 35 μV/V + 300 μV 40 μV/V + 300 μV 60 μV/V + 300 μV (25 + 1 000t) μs/s 2.5 μs/s 30 mV/V + 100 μV 30 mV/V + 100 μV 5 μs/s + 500 ps 5 μs/s + 4 ns 2.5 μs/s +0 ps/-100 ps 20 mV/V + 200 μV 2.5 μs/s	Fluke 5520A SC600	OEM and GIDEP Sourced Procedures
Phase - Source <sup>3</sup>	(10 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.1 ° 0.25 ° 0.5 ° 2.5 ° 5 ° 10 °	Fluke 5520A	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Capacitance - Source <sup>3</sup>	(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	OEM and GIDEP Sourced Procedures
1kHz	1 nF 10 nF 100 nF 1 µF	0.01 pF 1 pF 10 pF 100 pF	Gen Rad 1409 Series Fixed Capacitors	
1 kHz	100 pF	40 aF	Andeen Hagerling 1100/11A	
Capacitance - Measure <sup>3</sup> 10 Hz to 10 kHz	Up to 10 pF (10 to 100) pF 100 pF to 1 nF (1 to 10) nF (10 to 100) nF 100 nF to 1µF	6 mF/F 600 µF/F 230 µF/F 230 µF/F 230 µF/F 240 µF/F	Gen Rad 1689M	
1 kHz	1 pF to 1 µF	1.6 µF/F	Andeen Hagerling 2500A option E	
Inductance - Measure <sup>3</sup> @ 10 Hz to 10 kHz	1 µH to 10 H	240 µH/H	Gen Rad 1689M	

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Inductance - Source <sup>3</sup>  Fixed Points @ 1kHz	100 µH 1 mH 10 mH 20 mH 50 mH 100 mH 1 H 10 H	24 nH 240 nH 2.4 µH 4.8 µH 12 µH 24 µH 240 µH 2.4 mH	Gen Rad 1689M with: Gen Rad 1482-B Gen Rad 1482-E Gen Rad 1482-H Gen Rad 1482-J Gen Rad 1481-F Gen Rad 1482-L Gen Rad 1482-P Gen Rad 1482-T	OEM and GIDEP Sourced Procedures

## II. Electromagnetic - RF/Microwave

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Amplitude Modulation- Measure <sup>3</sup>  (-40 to 30) dBm Depth: 5 to 99 %	<b>100 kHz to 10 MHz</b> 10 Hz to 10 kHz <b>10 MHz to 26.5 GHz</b> (10 to 90) Hz (90 to 150) Hz 150 Hz to 50 kHz (50 to 100) kHz	1 % of reading + 0.01 %  0.67 % of reading + 0.01 % 0.27 % of reading + 0.01 % 0.67 % of reading + 0.01 % 1 % of reading + 0.01 %	Rohde & Schwarz FSMR-26	OEM and GIDEP Sourced Procedures
Amplitude Modulation – Source <sup>3</sup> Depth: 5 to 99 % 10 MHz to 26.5 GHz	10 Hz to 50 kHz (50 to 100) kHz	1.4 % of reading + 0.01 % 1.6 % of reading + 0.01 %	Rohde & Schwarz FSMR-26 Agilent 83650B	
Frequency Modulation – Measure <sup>3</sup> (-40 to 30) dBm Rate: 10 Hz to 10 kHz Dev.: ≤ 50 kHz peak  Rate: 10 Hz to 100 kHz Dev.: ≤ 500 kHz peak  Rate: 100 kHz to 200 kHz Dev.: ≤ 500 kHz peak	200 kHz to 10 MHz  10 MHz to 26.5 GHz  10 MHz to 26.5 GHz	0.67 % of Reading  0.67 % of Reading  2 % of Reading	Rohde & Schwarz FSMR-26	

<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>
Frequency Modulation – Source <sup>3</sup> 10 MHz to 26.5 GHz Dev: ≤ 500 kHz peak	10 Hz to 100 kHz (100 to 200) kHz	1.4 % of reading 2.3 % of reading	Rohde & Schwarz FSMR-26 Agilent 83650B	OEM and GIDEP Sourced Procedures
Phase Modulation – Measure <sup>3</sup> (-40 to 30) dBm Rate: 10 Hz 10 kHz Dev.: ≤ 1000 rad  Rate: 10 Hz 10 kHz Dev.: ≤ 1000 rad	200 kHz to 10 MHz  10 MHz to 26.5 GHz	0.67 % of Rdg + 0.003 rad  0.67 % of Rdg + 0.003 rad	Rohde & Schwarz FSMR-26	
RF Power – Measure <sup>3</sup> DC to 100 MHz 100 MHz to 4.2 GHz (4.2 to 8) GHz (8 to 18) GHz (18 to 26.5) GHz	(-10 to 26) dB (-10 to 26) dB (-10 to 26) dB (-10 to 26) dB (-10 to 26) dB	0.11 dB 0.12 dB 0.16 dB 0.18 dB 0.23 dB	Rohde & Schwarz FSMR-26 w/ NRP- Z37	
RF Power – Source <sup>3</sup> 10 MHz to 4.2 GHz  (4.2 to 8) GHz  (8 to 12.4) GHz  (12.4 to 18) GHz  (18 to 26.5) GHz	(-80 to 10) dBm (-110 to -80) dBm  (-80 to 10) dBm (-110 to -80) dBm  (-80 to 10) dBm (-110 to -80) dBm  (-80 to 10) dBm (-110 to -80) dBm  (-80 to 10) dBm (-110 to -80) dBm	0.17 dB + 0.005 dB/10 dBm 0.18 dB + 0.005 dB/10 dBm  0.18 dB + 0.005 dB/10 dBm 0.25 dB + 0.005 dB/10 dBm  0.19 dB + 0.005 dB/10 dBm 0.28 dB + 0.005 dB/10 dBm  0.21 dB + 0.005 dB/10 dBm 0.37 dB + 0.005 dB/10 dBm  0.25 dB + 0.005 dB/10 dBm 0.41 dB + 0.005 dB/10 dBm	Agilent 83650B Rohde & Schwarz FSMR-26 w/ NRP- Z37	

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Tuned RF Level – Measure <sup>3</sup> (cont.)				
(4.2 to 8) GHz	(-120 to -100) dBm	0.22 dB + 0.005 dB/10 dB		
(8 to 12.4) GHz	(-80 to 26) dBm (-100 to -80) dBm (-120 to -100) dBm	0.15 dB + 0.005 dB/10 dB 0.18 dB + 0.005 dB/10 dB 0.26 dB + 0.005 dB/10 dB		
(12.4 to 18) GHz	(-80 to 26) dBm (-100 to -80) dBm (-120 to -100) dBm	0.18 dB + 0.005 dB/10 dB 0.22 dB + 0.005 dB/10 dB 0.35 dB + 0.005 dB/10 dB		
(18 to 26.5) GHz	(-80 to 26) dBm (-100 to -80) dBm (-120 to -100) dBm	0.22 dB + 0.005 dB/10 dB 0.29 dB + 0.005 dB/10 dB 0.39 dB + 0.005 dB/10 dB		
Reference Level 100 kHz to 10 MHz	(-80 to 30) dBm (-100 to -80) dBm (-120 to -100) dBm	0.03 dB + 0.005 dB/10 dB 0.05 dB + 0.005 dB/10 dB 0.089 dB + 0.005 dB/10 dB		
10 MHz to 3.6 GHz	(-80 to 30) dBm (-100 to -80) dBm (-140 to -100) dBm	0.031 dB + 0.005 dB/10 dB 0.056 dB + 0.005 dB/10 dB 0.12 dB + 0.005 dB/10 dB		
(3.6 to 8) GHz	(-80 to 30) dBm (-100 to -80) dBm (-130 to -100) dBm	0.032 dB + 0.005 dB/10 dB 0.078 dB + 0.005 dB/10 dB 0.17 dB + 0.005 dB/10 dB		
(8 to 12.4) GHz	(-80 to 30) dBm (-100 to -80) dBm (-130 to -100) dBm	0.033 dB + 0.005 dB/10 dB 0.11 dB + 0.005 dB/10 dB 0.21 dB + 0.005 dB/10 dB		
(12.4 to 18) GHz	(-80 to 30) dBm (-100 to -80) dBm (-130 to -100) dBm	0.037 dB + 0.005 dB/10 dB 0.12 dB + 0.005 dB/10 dB 0.25 dB + 0.005 dB/10 dB		
(18 to 26.5) GHz	(-80 to 30) dBm (-100 to -80) dBm (-130 to -100) dBm	0.046 dB + 0.005 dB/10 dB 0.2 dB + 0.005 dB/10 dB 0.29 dB + 0.005 dB/10 dB		
			Rohde & Schwarz FSMR-26 w/ NRP- Z37	OEM and GIDEP Sourced Procedures



PARAMETER/ EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Tuned RF Level – Measure <sup>3</sup> Absolute Level 100 kHz to 4.2 GHz	(-80 to 26) dBm (-100 to -80) dBm (-130 to -100) dBm	0.12 dB + 0.005 dB/10 dB 0.13 dB + 0.005 dB/10 dB 0.14 dB + 0.005 dB/10 dB	Rohde & Schwarz FSMR-26 with NRP-Z37	OEM and GIDEP Sourced Procedures
(4.2 to 8) GHz	(-80 to 26) dBm (-100 to -80) dBm	0.14 dB + 0.005 dB/10 dB 0.17 dB + 0.005 dB/10 dB		

### III. Time and Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency - Source <sup>3</sup>	0.01Hz to 2 MHz 10 MHz to 20GHz (20 to 26.5) GHz	2.5 μHz/Hz + 5 μHz 4 X 10 <sup>-12</sup> Hz 1.2 X 10 <sup>-10</sup> Hz	Fluke 5520A Agilent 83650B Pendulum GPS-12R	OEM and GIDEP Sourced Procedures
Frequency - Measure <sup>3</sup>	DC to 20 GHz 20 GHz to 26.5 GHz	4 X 10 <sup>-12</sup> Hz 1.2 X 10 <sup>-10</sup> Hz	Pendulum GPS-12R Pendulum CNT-91 Rohde & Schwarz FSMR-26	

### IV. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Source <sup>7</sup>	0.01 °C 273.16 K	0.00011 °C 0.11 mK	TPW Cell	OEM and GIDEP Sourced Procedures
Temperature - Source <sup>3</sup> Immersion Probes	-75 °C (-30 to 100) °C (100 to 200) °C	0.03 °C 0.03 °C 0.04 °C	Dry Ice Bath with PRT Circulating Bath with PRT	
Temperature - Measure <sup>3</sup>	(-200 to 100) °C (100 to 420) °C	0.03 °C 0.04 °C	Hart Scientific 1502 with PRT	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Infrared <sup>3</sup> - Source	35 °C (35 to 100) °C (100 to 200) °C (200 to 350) °C (350 to 500) °C	0.35 °C 0.5 °C 0.7 °C 1.2 °C 1.6 °C	Hart Scientific 4181	OEM and GIDEP Sourced Procedures
Humidity - Source	(10 to 95) %	0.5 %RH	Thunder Scientific 2500	
Humidity – Measure	(0 to 90) % (90 to 100) %	1.4 %RH 2.5 %RH	Vaisala HM141/HMP 46	

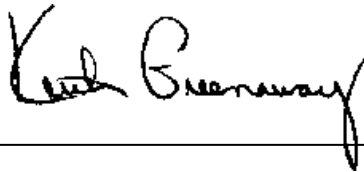
## V. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pressure - Source/Measure <sup>3</sup>	(0 to 7.5) psi (7.5 to 30) psi	0.0007 psi 0.000093 psi/psi	Ruska 7250i	OEM and GIDEP Sourced Procedures
	(15 to 300) psi	0.000093 psi/psi	Ruska 7250xi	
	(0 to 15) psia (15 to 300) psia	0.0014 psi 0.000093 psi/psi		
Tachometers Non-Contact <sup>3</sup>	(60 to 100,000) rpm	(0.62 rpm + 0.6R) rpm	Fluke 5520A	
Balances <sup>3</sup>	up to 220g	0.19 mg	Class 0 Weights	OEM and NIST Handbook 44
	up to 1.2 kg up to 3.2 kg up to 5.2 kg	2.9 mg 6.5 mg 280 mg	Class 1 Weights and Class 0 Weights	
	up to 20 kg up to 34 kg	280 mg 180 mg	Class 1 Weights	

## VI. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Indicators <sup>3</sup>	Up to 2 in	35 µin	Micrometer Head	WI-013
Calipers <sup>3,4</sup>	Up to 12 in	(6.7L + 382) µin	Gage Blocks	WI-014
Micrometers <sup>3,4,5</sup>	Up to 6 in	(41 + 6.5L + 0.6R) µin		WI-015
Profilometers <sup>3</sup> Stylus Linearity Calibration	(12 to 20) µin 19 µin 118 µin	2.1 µin 2.1 µin 2.1 µin	Roughness Specimens	OEM and GIDEP Sourced Procedures
Pins/Plugs	(0 to 3) in	46 µin	P&W Supermicrometer and Gage Blocks	
Threaded Plugs  Pitch Diameter Major Diameter	  0.375 in 0.375 in	  46 µin 39 µin	P&W Supermicrometer and Thread Measuring Wires	ASME B1.2

- Notes:
1. Calibration and Measurement Capabilities (CMC) (Expanded Uncertainties) are based on approximately a 95% confidence interval, with a coverage factor of  $k=2$ .
  2. This laboratory provides 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 scope of accreditation.
  3. On-site calibration is offered for this parameter.
  4. The use of (R) signifies Resolution of the unit under test.
  5. The use of (L) stands for Length in inches.
  6. The use of (t) is an expression of Time in seconds.
  7. CMC does not include possible contributions to uncertainty from the unit under test.
  8. This scope is part of and must be included with the Certificate of Accreditation No. AC-1398.



Vice President