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

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CALIBRATION

Valid To: February 29, 2012 Certificate Number: 2133.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Gage Blocks – Length	Up to 1 in (Over 1 to 6) in	3.5 µin (5 + 0.5*L*) µin	P&W labmaster & master gage blocks
Micrometers[3] – Inside, Outside, Depth	Up to 20 in	(0.6*R* + 10*L*) µin	Gage blocks
Calipers[3] – Outside, Inside, Depth and End Face	Up to 48 in	(0.6*R* + 5*L*) µin	Gage blocks
Dial Indicators[3]	(0.015 to 4) in	0.6*R*	P&W model C supermic
Height Gages[3]	(1 to 24) in	(65 + 1*L*) µin	Gage blocks

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Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Plug/Pin Gages	(0.005 to 10) in	(21 + 10*D*) μin	P&W universal supermic, grade 1 gage blocks
Plain Rings	(0.25 to 9) in	(20 + 7*D*) μin	P&W universal supermic, grade 1 gage blocks
Tape Measure (Steel)	(0 to 25) ft	0.037 in	Gage blocks and reference ruler
Rulers[3]	Up to 12 in	(470 + 30*L*) μin	Gage blocks

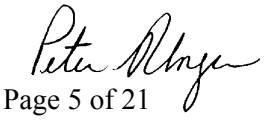
II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Voltage[3] – Measure	Up to 200 mV 200 mV to 2V (2 to 20) V (20 to 200) V (200 to 1000) V (10 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V (1 to 10) kV	4.5 μV/V + 0.1 μV 3 μV/V + 0.4 μV 3 μV/V + 4 μV 4.5 μV/V + 40 μV 4.5 μV/V + 0.5 mV 11 μV/V + 0.3 μV 10 μV/V + 0.3 μV 10 μV/V + 0.5 μV 12 μV/V + 30 μV 22 μV/V + 100 μV 0.1 %	Fluke 8508A/01 HP 3458A w/ divider
DC Voltage[3] – Generate	Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (100 to 1100) V	7.5 μV/V + 0.4 μV 5 μV/V + 0.7 μV 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/03

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Voltage[3] – Generate (cont.)	Up to 330 mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1000) V	20 µV/V + 1 µV 11 µV/V + 2 µV 12 µV/V + 20 µV 18 µV/V + 150 µV 18 µV/V + 1.5 mV	Fluke 5520A
Fixed Point	10 V	2 parts in 10^6 (trend < 1 part in 10^6)	Fluke 7000 & 7000N
DC Current[3] – Measure	Up to 200 µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2.0 A (2 to 20) A (10 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	12 µA/A + 0.4 nA 12 µA/A + 4 nA 13 µA/A + 40 nA 36 µA/A + 0.8 µA 0.017 % + 16 µA 0.038 % + 400 µA 25 µA/A + 0.8 nA 25 µA/A + 5 nA 25 µA/A + 50 nA 40 µA/A + 0.5 µA 0.012 % + 10 µA	Fluke 8508A/01 HP 3458A
DC Current[3] – Generate	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 (2.2 to 10) A (10 to 20) A (20 to 1000) A	40 µA/A + 6 nA 35 µA/A + 7 nA 35 µA/A + 40 nA 45 µA/A + 10 µA 80 µA/A + 49 µA 0.036 % + 480 nA 19 mA 0.64 %	Fluke 5720A w/ 5725A w/5520A & coil
Resistance[3] – Measure	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 (1 to 10) kΩ	15 µΩ/Ω + 4 µΩ 9 µΩ/Ω + 14 µΩ 7.5 µΩ/Ω + 50 µΩ 7.5 µΩ/Ω + 0.5 mΩ 7.5 µΩ/Ω + 5 mΩ 7.5 µΩ/Ω + 50 mΩ 8.5 µΩ/Ω + 1 Ω 15 µΩ/Ω + 100 Ω 60 µΩ/Ω + 10 kΩ 0.053 % + 1 MΩ 1 part in 10^6	Fluke 8508A Thomas 1 Ω and Guildline 9975

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Resistance[3] – Generate	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 330 MΩ to 1.1 GΩ	40 μΩ/Ω 30 μΩ/Ω 28 μΩ/Ω 28 μΩ/Ω 28 μΩ/Ω 28 μΩ/Ω 28 μΩ/Ω 28 μΩ/Ω 28 μΩ/Ω 32 μΩ/Ω 32 μΩ/Ω 60 μΩ/Ω 0.013 % 0.025 % 0.05 % 0.3 % 1.5 %	Fluke 5520A
Resistance[3] – Generate Fixed Points	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ 10 Ω	95 μΩ/Ω 95 μΩ/Ω 23 μΩ/Ω 23 μΩ/Ω 23 μΩ/Ω 10 μΩ/Ω 10 μΩ/Ω 8.5 μΩ/Ω 8.5 μΩ/Ω 8.5 μΩ/Ω 8.5 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 20 μΩ/Ω 21 μΩ/Ω 40 μΩ/Ω 47 μΩ/Ω 0.35 part in 10^6	Fluke 5720A Thomas 1 Ω

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Generate			
Up to 220 µA			
	(10 to 20) Hz	0.025 % + 16 nA	Fluke 5720A
	(20 to 40) Hz	0.016 % + 10 nA	
	40 Hz to 1 kHz	0.012 % + 8 nA	
	(1 to 5) kHz	0.028 % + 12 nA	
	(5 to 10) kHz	0.11 % + 65 nA	
(0.22 to 2.2) mA			
	(10 to 20) Hz	0.25 % + 40 nA	
	(20 to 40) Hz	0.16 % + 35 nA	
	40 Hz to 1 kHz	0.12 % + 35 nA	
	(1 to 5) kHz	0.02 % + 110 nA	
	(5 to 10) kHz	0.11 % + 650 nA	
(2.2 to 22) mA			
	(10 to 20) Hz	0.025 % + 400 nA	
	(20 to 40) Hz	0.016 % + 350 nA	
	40 Hz to 1 kHz	0.012 % + 350 nA	
	(1 to 5) kHz	0.02 % + 550 nA	
	(5 to 10) kHz	0.11 % + 5 µA	
(22 to 220) mA			
	(10 to 20) Hz	0.025 % + 4 µA	Fluke 5720A
	(20 to 40) Hz	0.016 % + 3.5 µA	
	40 Hz to 1 kHz	0.012 % + 2.5 µA	
	(1 to 5) kHz	0.02 % + 3.5 µA	
	(5 to 10) kHz	0.11 % + 10 µA	
(220 to 2.2) A			
	(20 to 1000) Hz	0.026 % + 35 µA	w/ 5725A
	(1 to 5) kHz	0.045 % + 80 µA	
	(5 to 10) kHz	0.7 % + 160 µA	
(2.2 to 11) A			
	(40 to 1000) Hz	0.046 % + 170 µA	Fluke 5720A w/5725A
	(1 to 5) kHz	0.095 % + 380 µA	
	(5 to 10) kHz	0.36 % + 750 µA	
(29 to 330) µA			
	(10 to 20) Hz	0.2 % + 0.1 µA	
	(20 to 45) Hz	0.15 % + 0.1 µA	
	45 Hz to 1 kHz	0.13 % + 0.1 µA	
	(1 to 5) kHz	0.3 % + 0.15 µA	
	(5 to 10) kHz	0.8 % + 0.2 µA	
	(10 to 30) kHz	1.6 % + 0.4 µA	
(0.33 to 3.3) mA			
	(10 to 20) Hz	0.2 % + 0.15 µA	
	(20 to 45) Hz	0.13 % + 0.15 µA	
	45 Hz to 1 kHz	0.1 % + 0.15 µA	
	(1 to 5) kHz	0.2 % + 0.2 µA	
	(5 to 10) kHz	0.5 % + 0.3 µA	
	(10 to 30) kHz	1 % + 0.6 µA	



Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
AC Current[3] (cont.) – Generate			
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.18 % + 2 µA 0.09 % + 2 µA 0.04 % + 2 µA 0.08 % + 2 µA 0.2 % + 3 µA 0.4 % + 4 µA	Fluke 5720A w/5725A
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.18 % + 20 µA 0.09 % + 20 µA 0.04 % + 20 µA 0.1 % + 50 µA 0.2 % + 100 µA 0.4 % + 200 µA	
(0.33 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % + 100 µA 0.05 % + 100 µA 0.6 % + 1 mA 2.5 % + 5 mA	Fluke 5520A LCOMP Off
(3 to 11) A	(1 to 5) kHz (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.06 % + 2 mA 0.1 % + 2 mA 3 % + 2 mA 0.12 % + 5 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz	0.15 % + 5 mA 3 % + 5 mA	
(20.5 to 1000) A	(45 to 65) Hz	0.25 % + 0.6*R*	Fluke 5520 & Coil

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Measure			
Up to 200 μA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.029 % + 20 nA 0.028 % + 20 nA 0.065 % + 20 nA 0.4 % + 20 nA	Fluke 8508A
200 μA to 2 mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.029 % + 200 nA 0.028 % + 200 nA 0.065 % + 200 nA 0.4 % + 200 nA	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.029 % + 2 μA 0.028 % + 2 μA 0.065 % + 2 μA 0.4 % + 2 μA	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.029 % + 20 μA 0.025 % + 20 μA 0.06 % + 20 μA	
200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.06 % + 200 μA 0.07 % + 200 μA 0.3 % + 200 μA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.08 % + 2 mA 0.25 % + 2 mA	
(10 to 100) μA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.4 % + 10 nA 0.15 % + 10 nA 0.06 % + 10 nA 0.06 % + 10 nA	HP 3458A
(1 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.4 % + 20 μA 0.15 % + 20 μA 0.06 % + 20 μA 0.03 % + 20 μA	
(1 to 100) mA	(5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.06 % + 20 μA 0.4 % + 40 μA 0.55 % + 150 μA	
(0.1 to 1) A	(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	0.4 % + 0.02 mA 0.16 % + 0.02 mA 0.08 % + 0.02 mA 0.1 % + 0.02 mA 0.3 % + 0.02 mA 1.0 % + 0.04 mA	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Generate			
Up to 2.2 mV			
	(10 to 20) Hz	0.024 % + 4 µV	Fluke 5720A
	(20 to 40) Hz	90 µV/V + 4 µV	
	40 Hz to 20 kHz	80 µV/V + 4 µV	
	(20 to 50) kHz	0.02 % + 4 µV	
	(50 to 100) kHz	0.05 % + 5 µV	
	(100 to 300) kHz	0.11 % + 10 µV	
	(300 to 500) kHz	0.14 % + 20 µV	
	500 kHz to 1 MHz	0.27 % + 20 µV	
(2.2 to 22) mV			
	(10 to 20) Hz	0.024 % + 4 µV	
	(20 to 40) Hz	90 µV/V+ 4 µV	
	40 Hz to 20 kHz	80 µV/V+ 4 µV	
	(20 to 50) kHz	0.02 % + 4 µV	
	(50 to 100) kHz	0.05 % + 5 µV	
	(100 to 300) kHz	0.11 % + 10 µV	
	(300 to 500) kHz	0.14 % + 20 µV	
	500 kHz to 1MHz	0.27 % + 20 µV	
(22 to 220) mV			
	(10 to 20) Hz	0.024 % + 12 µV	
	(20 to 40) Hz	90 µV/V+ 7 µV	
	40 Hz to 20 kHz	80 µV/V+ 7 µV	
	(20 to 50) kHz	0.02 % + 7 µV	
	(50 to 100) kHz	0.046 % + 17 µV	
	(100 to 300) kHz	0.09 % + 20 µV	
	(300 to 500) kHz	0.14 % + 25 µV	
	500 kHz to 1 MHz	0.27 % + 45 µV	
(0.22 to 2.2) V			
	(10 to 20) Hz	0.024 % + 40 µV	
	(20 to 40) Hz	90 µV/V + 15 µV	
	40 Hz to 20 kHz	45 µV/V + 8 µV	
	(20 to 50) kHz	75 µV/V + 10 µV	
	(50 to 100) KHz	0.011 % + 300 µV	
	(100 to 300) kHz	0.042 % + 80 µV	
(0.22 to 2.2) V			
	(300 to 500) kHz	0.1 % + 200 µV	
	500 kHz to 1 MHz	0.17 % + 300 µV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] (cont.) – Generate			
(2.2 to 22) V	(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	0.024 % + 400 µV 90 µV/V+ 150 µV 45 µV/V + 50 µV 75 µV/V + 100 µV 0.01 % + 200 µV 0.028 % + 600 µV 0.1 % + 2 mV 0.15 % + 3.2 mV	Fluke 5720A
(22 to 220) V	(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	0.024 % + 4 mV 90 µV/V + 1.5 mV 52 µV/V + 0.6 mV 80 µV/V + 1 mV 0.015 % + 2.5 mV 0.09 % + 16 mV 0.44 % + 40 mV 0.8 % + 80 mV	Fluke 5720A, Volt-Hertz limitation over 100 kHz. Max output is 2.2×10^7 V-Hz.
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.017 % + 6 mV 0.06 % + 11 mV	Max 250 V for (15 to 50) Hz
(220 to 1100) V	(1 to 20) kHz (20 to 30) kHz	0.017 % + 6 mV 0.06 % + 11 mV	Fluke 5720A w/ 5725A
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.06 % + 11 mV 0.23 % + 45 mV	
(1 to 33) mV	(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	0.08 % + 6 µV 0.015 % + 6 µV 0.02 % + 6 µV 0.1 % + 6 µV 0.35 % + 12 µV 0.8 % + 50 µV	Fluke 5520A
(33 to 330) mV	(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	0.05 % + 8 µV 0.015 % + 8 µV 0.016 % + 8 µV 0.065 % + 8 µV 0.08 % + 32 µV 0.2 % + 70 µV	
(0.33 to 3.3) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz	0.03 % + 50 µV 0.015 % + 60 µV 0.019 % + 60 µV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] (cont.) – Generate			
(0.33 to 3.3) V	(20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.03 % + 50 µV 0.07 % + 130 µV 0.24 % + 0.6 mV	Fluke 5520A
AC Voltage – Measure			
Up to 200 mV	(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	0.016 % + 14 µV 0.013 % + 4 µV 0.011 % + 4 µV 0.011 % + 2 µV 0.011 % + 4 µV 0.031 % + 8 µV 0.071 % + 20 µV	Fluke 8508A
Up to 200 mV	(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	0.014 % + 120 µV 0.011 % + 20 µV 85 µV/V + 20 µV 65 µV/V + 20 µV 85 µV/V + 20 µV 0.021 % + 40 µV 0.051 % + 0.2 mV 0.3 % + 2 mV	
(0.2 to 2) V	300 kHz to 1 MHz	1 % + 20 mV	
(2 to 20) V	(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	0.014 % + 1.2 mV 0.011 % + 0.2 mV 85 µV/V + 0.2 mV 65 µV/V + 0.2 mV 85 µV/V + 0.2 mV 0.021 % + 0.4 mV 0.051 % + 2 mV 0.3 % + 20 mV 1 % + 200 mV	
(20 to 200) V	(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	0.014 % + 1.2 mV 0.011 % + 0.2 mV 85 µV/V + 0.2 mV 65 µV/V + 0.2 mV 85 µV/V + 0.2 mV 0.021 % + 0.4 mV 0.051 % + 2 mV 0.3 % + 20 mV 1 % + 200 mV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage (cont.) – Measure			
(200 to 300) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.014 % + 70 parts in 10^6 0.011 % + 20 parts in 10^6 95 µV/V + 20 parts in 10^6 0.021 % + 40 parts in 10^6 0.051 % + 200 parts in 10^6	Fluke 8508A
(300 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.034 % + 70 mV 0.031 % + 20 mV 0.13 % + 20 mV 0.14 % + 40 mV 0.17 % + 200 mV	
600 µV to 2.2 mV	(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	0.17 % + 1.3 µV 0.074 % + 1.3 µV 0.042 % + 1.3 µV 0.081 % + 2 µV 0.12 % + 2.5 µV 0.23 % + 4 µV 0.24 % + 8 µV	Fluke 5790A/03
Flatness – 500 kHz to 30 MHz (Relative to 1 kHz)	500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.07 % + 1 µV 0.07 % + 1 µV 0.10 % + 1 µV 0.17 % + 1 µV 0.37 % + 2 µV	
(2.2 to 7) mV	(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	0.085 % + 1.3 µV 0.037 % + 1.3 µV 0.021 % + 1.3 µV 0.04 % + 2 µV 0.06 % + 2.5 µV 0.12 % + 4 µV 0.13 % + 8 µV	
Flatness – 500 kHz to 30 MHz (Relative to 1 kHz)	500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.07 % + 1 µV 0.07 % + 1 µV 0.10 % + 1 µV 0.17 % + 1 µV 0.37 % + 1 µV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage (cont.) – Measure			
(7 to 22) mV	(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	0.029 % + 1.3 µV 0.019 % + 1.3 µV 0.011 % + 1.3 µV 0.021 % + 2 µV 0.031 % + 2.5 µV 0.81 % + 4 µV 0.089 % + 8 µV	Fluke 5790A/03
Flatness – 500 kHz to 30 MHz (Relative to 1 kHz)	500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.07 % 0.07 % 0.10 % 0.17 % 0.37 %	
Flatness – (22 to 70) mV	(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	0.024 % + 1.5 µV 0.012 % + 1.5 µV 65 µV/V + 1.5 µV 0.013 % + 2 µV 0.026 % + 2.5 µV 0.051 % + 4 µV 0.067 % + 8 µV	
Flatness – 500 kHz to 30 MHz (Relative to 1 kHz)	500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.05 % 0.05 % 0.10 % 0.15 % 0.35 %	
(70 to 220) mV	(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	0.021 % 82 µV/V 34 µV/V 67 µV/V 0.016 % + 2.5 µV 0.025 % + 4 µV 0.038 % + 8 µV	
Flatness – 500 kHz to 30 MHz (Relative to 1 kHz)	500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.05 % 0.05 % 0.10 % 0.15 % 0.35 %	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage (cont.) – Measure			
(220 to 700) mV	(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	0.021 % 73 µV/V 27 µV/V 47 µV/V 79 µV/V + 2.5 µV 0.018 % + 4 µV 0.03 % + 8 µV	Fluke 5790A/03
Flatness – 500 kHz to 30 MHz (Relative to 1 kHz)	500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.05 % 0.05 % 0.10 % 0.15 % 0.35 %	
700 mV to 2.2 V	(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	0.02 % 63 µV/V 18 µV/V 43 µV/V 71 µV/V 0.016 % 0.026 %	
(2.2 to 7) V	500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.05 % 0.05 % 0.10 % 0.15 % 0.35 %	
Flatness – 500 kHz to 30 MHz (Relative to 1 kHz)	(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	0.02 % 63 µV/V 18 µV/V 44 µV/V 81 µV/V 0.019 % 0.04 %	
(7 to 22) V	500 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.05 % 0.05 % 0.10 % 0.15 % 0.35 %	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage (cont.) – Measure			
(22 to 70) V	(10 to 20) Hz	0.02 %	Fluke 5790A/03
	(20 to 40) Hz	63 µV/V	
	40 Hz to 20 kHz	21 µV/V	
	(20 to 50) kHz	44 µV/V	
	(50 to 100) kHz	81 µV/V	
	(100 to 300) kHz	0.019 %	
	(300 to 500) kHz	0.04 %	
	500 kHz to 1 MHz	0.12 %	
(70 to 220) V	(10 to 20) Hz	0.02 %	
	(20 to 40) Hz	63 µV/V	
	40 Hz to 20 kHz	25 µV/V	
	(20 to 50) kHz	55 µV/V	
	(50 to 100) kHz	94 µV/V	
	(100 to 300) kHz	0.02 %	
(70 to 220) V	(300 to 500) kHz	0.041 %	
	500 kHz to 1 MHz	0.12 %	
	(10 to 20) Hz	0.02 %	
	(20 to 40) Hz	63 µV/V	
	40 Hz to 20 kHz	23 µV/V	
	(20 to 50) kHz	63 µV/V	
	(50 to 100) kHz	98 µV/V	
	(100 to 300) kHz	0.021 %	
	(300 to 500) kHz	0.05 %	
(220 to 700) V	(10 to 20) Hz	0.02 %	
	(20 to 40) Hz	92 µV/V	
	40 Hz to 20 kHz	36 µV/V	
	(20 to 50) kHz	0.013 %	
	(50 to 100) kHz	0.05 %	
(700 to 1000) V	(10 to 20) Hz	0.02 %	
	(20 to 40) Hz	92 µV/V	
	40 Hz to 20 kHz	33 µV/V	
	(20 to 50) kHz	0.013 %	
	(50 to 100) kHz	0.05 %	
(1 to 10) kV	(45 to 65) Hz	0.72 %	HP 3456A w/ Divider

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
Phase[3] – Generate	(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
Capacitance[3] – Generate	(0.19 to 3.3) nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF (0.33 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 (0.33 to 1.1) mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.5 % + 0.01 nF 0.25 % + 0.01 nF 0.25 % + 0.1 nF 0.25 % + 0.3 nF 0.25 % + 1 nF 0.25 % + 3 nF 0.25 % + 10 nF 0.4 % + 30 nF 0.45 % + 100 nF 0.45 % + 300 nF 0.45 % + 1 µF 0.45 % + 3 µF 0.45 % + 10 µF 0.75 % + 30 µF 0.46 % + 100 µF	Fluke 5520A
Electrical Calibration of Thermocouples[3] –			
Type B	600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1550 °C 1550 °C to 1820 °C	0.44 °C 0.34 °C 0.3 °C 0.33 °C	Fluke 5520A
Type C	0 °C to 150 °C 150 °C to 650°C 650 °C to 1000 °C 1000 °C to 1800 °C 1800 °C to 2316 °C	0.30 °C 0.26 °C 0.31 °C 0.5 °C 0.84 °C	
Type E	-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C	0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouples[3] (cont.) –			
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	Fluke 5520A
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C	
Type L	-200 °C to -100 °C -100 °C to 800 °C 800 °C to 900 °C	0.37 °C 0.26 °C 0.17 °C	
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.4 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.57 °C 0.35 °C 0.33 °C 0.4 °C	
Type S	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400°C	0.63 °C 0.24 °C 0.16 °C 0.14 °C	
Type U	-200 °C to 0 °C 0 °C to 600°C	0.56 °C 0.27 °C	

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Electrical Calibration of RTD[3] –			
Pt 385, 100 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C	0.05 °C 0.07 °C 0.09 °C 0.12 °C 0.12 °C	Fluke 5520A
Pt 385, 100 Ω	630 °C to 800 °C	0.23 °C	
Pt 3926, 100 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C	0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C	
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C	
AC Power, Low Frequency[3] –			
3.3 mA to 21 A (45 to 65) Hz	(33 to 330) mV (0.33 to 1020) V	0.14 % 0.12 %	Fluke 5520A
DC Power[3]–			
(0.33 to 30) mA (0.33 to 3) A (3 to 21) A	33 mV to 1020 V 33 mV to 1020 V 33 mV to 1020 V	0.023 % 0.022 % 0.07 %	Fluke 5520A

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Oscilloscope Calibration[3] –			
Squarewave Signal			
(50 Ω at 1 kHz)	(1 to 110) mV 110 mV to 2.2 V (2.2 to 11) V (11 to 1100) V	0.28 % + 48 µV 0.28 % + 120 µV 0.28 % + 1.2 mV 0.28 % + 12 mV	Fluke 5520A/SC600
(1 MΩ at 1 kHz)	(1 to 110) mV 110 mV to 2.2 V (2.2 to 11) V (11 to 1100) V	0.12 % + 48 µV 0.12 % + 120 µV 0.12 % + 1.2 mV 0.12 % + 12 mV	
Leveled Sine Wave			
Amplitude (50 kHz ref.)	50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	2 % + 300 µV 3.5 % + 300 µV 4 % + 300 µV 6 % + 300 µV	
Flatness (rel. to 50 kHz)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	1.5 % + 100 µV 2 % + 100 µV 4 % + 100 µV	
Time Marker (50 Ω Source and Period)	5 s to 50 ms 20 ms to 2 ns	26 ns + 0.07 ms 2.6 ns	
Rise Time	≤ 350 ps	+0 / -100 ps	

III. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Pressure, Nitrogen –			
Gage/ABS	(0.2 to 25) psi (1.7 to 100) psi (2 to 1000) psi	20 parts in 10^6 rdg	Ruska DWT, gage mode

Parameter/Equipment	Range	CMC[2] (±)	Comments
Pressure, Nitrogen – (cont)			
Gage/ABS	(0.2 to 25) psia (1.7 to 100) psia (2 to 1000) psia	20 parts in 10^6 rdg	Ruska DWT, abs mode
Negative Gage	(-14.5 to 0) psi	30 parts in 10^6 rdg	Ruska DWT, gage mode
	(10 to 16) psia	0.01 % of rdg	DHI RPM4
Barometric			
Low	(0.001 to 2) in H_20 (2 to 10) in H_20	0.00033 in H_20 0.002 in H_20	Micro tector Hook gage
Scales[3]	(1 to 500) mg (1 to 100) g (200 to 1000) g (1 to 10) kg (10 to 450) kg	0.017 mg 0.18 mg 1.7 mg 17 mg 0.021 kg	Class F, Class 1 or 2 weights
Torque	(2 to 20) in·oz (15 to 200) in·oz (4 to 50) in·lb (30 to 400) in·lb (80 to 1000) in·lb (20 to 250) ft·lb (100 to 1000) ft·lb	0.063 in·oz 0.59 in·oz 0.15 in·lb 1.2 in·lb 3 in·lb 0.73 ft·lb 2.9 ft·lb	Arm and weights
Torque Wrenches	(2 to 20) in·oz (15 to 200) in·oz (4 to 50) in·lb (30 to 400) in·lb (80 to 1000) in·lb (20 to 250) ft·lb (100 to 1000) ft·lb	0.24 in·oz 2.4 in·oz 0.6 in·lb 4.8 in·lb 12 in·lb 3 ft·lb 12 ft·lb	CDI torque system
Force Compression	(100 to 2000) lbs (1 to 20) klbs (5 to 50) klbs (10 to 100) klbs	0.28 lbf 3.1 lbf 12 lbf 20 lbf	Load cells

Parameter/Equipment	Range	CMC[2] (±)	Comments
Tension	(100 to 2000) lbs	0.3 lbf	Load cells

IV. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Relative Humidity	10 % RH to 95 % RH	2.0 % RH	Rotronic RH transmitter, Fluke Hydra data logger
Thermometers – Measure and Measuring Equipment	(-197 to 420) °C (-40 to 250) ºF	0.05 °C 0.05 ºF	Hart 1575, SPRT, Azonix A1011, and RTD
IR Thermometers	(-15 to 120) °C (35 to 500) °C	1.1 °C 1.5 °C	Hart Scientific 4180 Hart Scientific 4181
Welch Allyn Blackbody	(29 to 43) °C	0.059 °C	Master blackbody, SPRT

V. Time & Frequency

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Frequency – Measuring Equipment	0.01 Hz to 2 MHz	2.5 µHz/Hz + 5 µHz	Fluke 5520A
Frequency – Measure	(1 to 40) Hz 40 Hz to 10 MHz	0.05 % 0.01 %	Agilent 3458A

Parameter/Equipment	Range	CMC[2] (±)	Comments
Stop Watch	15 min to 24 hr	300 ms	Agilent 53131A

[1] This laboratory offers commercial and field calibration service.

[2] Calibration and Measurement Capability (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] Field calibration service is available for this calibration and this laboratory meets A2LA *R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches, R is the numerical value of the resolution of the device in microinches, D is the numerical value of the nominal diameter of the device measured in inches.

[5] In the statement of CMC, the value is defined as the percentage of reading.

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This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 10th day of May 2010.

President & CEO
For the Accreditation Council
Certificate Number 2133.01
Valid to February 29, 2012

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.