



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: December 31, 2024

Certificate Number: 2733.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory at the location above as well as the one satellite location listed below to perform the following calibrations^{1, 8}:

I. Acoustical Quantities

Parameter/Equipment	Frequency	CMC ^{2, 5, 7} (±)	Comments
Sound Pressure Level ³ – Measure	(70 to 130) dB	0.61 dB	Quest 1800 meter & ACO 7023 microphone
	250 Hz to 1 kHz	0.001 Hz	Frequency counter
Sound Level ³ – Measurement Equipment Re: 20 µPa	114 dB, 125 Hz to 2 kHz	0.32 dB + 0.6R	Genrad 1986 calibrator
	(84, 104) dB, 125 Hz to 4 kHz	0.59 dB + 0.6R	
	(74, 94) dB, 125 Hz to 4 kHz	0.71 dB + 0.6R	
	114 dB, 4 kHz	0.59 dB + 0.6R	

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Outside Micrometers	Up to 1 in (1 to 12) in	$(81 + 0.6R) \mu\text{in}$ $(73 + 8.6L + 0.6R) \mu\text{in}$	Gage blocks
Calipers (OD, ID, Depth, Step)	Up to 12 in	$(230 + 7.1L + 0.6R) \mu\text{in}$	Gage blocks

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage ³ – Generate	(0 to 220) mV (> 0.22 to 2.2) V (> 2.2 to 11) V (> 11 to 22) V (> 22 to 220) V (> 220 to 1100) V	7.6 $\mu\text{V/V} + 0.6 \mu\text{V}$ 6.2 $\mu\text{V/V} + 0.9 \mu\text{V}$ 6.2 $\mu\text{V/V} + 3.1 \mu\text{V}$ 6.2 $\mu\text{V/V} + 6.2 \mu\text{V}$ 7.0 $\mu\text{V/V} + 78 \mu\text{V}$ 8.8 $\mu\text{V/V} + 0.47 \text{ mV}$	Fluke 5700A
DC Voltage ³ – Measure	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V (> 1000 to 10 000) V (> 10 000 to 100 000) V	13 $\mu\text{V/V} + 0.3 \mu\text{V}$ 12 $\mu\text{V/V} + 0.3 \mu\text{V}$ 12 $\mu\text{V/V} + 0.5 \mu\text{V}$ 14 $\mu\text{V/V} + 30 \mu\text{V}$ 14 $\mu\text{V/V} + 0.1 \text{ mV} +$ 12 $\mu\text{V/V} (\text{V}_{\text{IN}} / 1000)^2$ 0.03 % + 0.046 V 0.06 % + 1.1 V	HP 3458A Vitrek 4700 Vitrek 4700 & Vitrek HVL-100
DC Current ³ – Generate	(0 to 220) μA > 220 μA to 2.2 mA (> 2.2 to 22) mA (> 22 to 220) mA (> 220 to 1.1) A (1.1 to 3) A (3 to 11) A (> 2.2 to 11) A (> 11 to 20) A	47 $\mu\text{A/A} + 10 \text{ nA}$ 47 $\mu\text{A/A} + 10 \text{ nA}$ 56 $\mu\text{A/A} + 80 \text{ nA}$ 54 $\mu\text{A/A} + 0.8 \mu\text{A}$ 81 $\mu\text{A/A} + 12 \mu\text{A}$ 290 $\mu\text{A/A} + 31 \mu\text{A}$ 390 $\mu\text{A/A} + 390 \mu\text{A}$ 0.047 % + 260 μA 0.025 % + 1 mA	Fluke 5700A Fluke 5522A Fluke 55XXA Fluke 5700A & 5220A

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Current ³ – Generate Non-Toroidal	(> 20 to 110) A (> 110 to 550) A (> 550 to 1000) A	0.63 % + 0.58 A 0.63 % + 0.58 A 0.63 % + 0.58 A	Fluke 55XXA & Fluke 5500A coil Fluke 5522A, Fluke 5500-A coil
DC Current ³ – Measure	(0 to 100) nA > 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 (> 1 to 20) A (> 20 to 400) A (> 400 to 1000) A	61 µA/A + 40 pA 54 µA/A + 40 pA 29 µA/A + 100 pA 29 µA/A + 0.8 nA 27 µA/A + 0.005 µA 43 µA/A + 0.05 µA 46 µA/A + 0.5 µA 0.013 % + 10 µA 0.011 % 1.5 % + 0.3 A 1.5 % + 3 A	HP 3458A HP 3458A & Y5020 LEM HEME
DC Resistance ³ – Measure	(0 to 10) Ω (> 10 to 100) Ω > 100 Ω to 1 kΩ (> 1 to 10) kΩ (> 10 to 100) kΩ > 100 kΩ to 1 MΩ (> 1 to 10) MΩ (> 10 to 100) MΩ > 100 MΩ to 1 GΩ	23 µΩ/Ω + 50 µΩ 17 µΩ/Ω + 500 µΩ 15 µΩ/Ω + 500 µΩ 15 µΩ/Ω + 5 mΩ 15 µΩ/Ω + 50 mΩ 15 µΩ/Ω + 2 Ω 66 µΩ/Ω + 100 Ω 0.058 % + 1 kΩ 0.58 % + 10 kΩ	HP 3458A
DC Power ³ – Generate (33 mV to 1020 V) (0.33 to 329.99) mA (0.33 to 2.9999) A (3 to 20.5) A	 10.89 µW to 9.18 W 10.89 mW to 3.06 kW 99 mW to 20.91 kW	 0.018 % 0.017 % 0.054 %	 Fluke 5522A

Parameter/Equipment	Range	CMC ^{2, 4, 6} (±)	Comments
DC Resistance ³ – Generate	(0 to 10.9) Ω	94 μΩ/Ω + 0.006 Ω	Fluke 55XXA
	(11 to 32.9) Ω	94 μΩ/Ω + 0.012 Ω	
	(33 to 109.9) Ω	70 μΩ/Ω + 0.012 Ω	
	(110 to 329.9) Ω	70 μΩ/Ω + 0.012 Ω	
	330 Ω to 1.09 kΩ	70 μΩ/Ω + 0.05 Ω	
	(1.1 to 3.29) kΩ	70 μΩ/Ω + 0.05 Ω	
	(3.3 to 10.9) kΩ	70 μΩ/Ω + 0.5 Ω	
	(11 to 32.9) kΩ	70 μΩ/Ω + 0.5 Ω	
	(33 to 109.9) kΩ	0.012 % + 5 Ω	
	(110 to 329) kΩ	0.013 % + 5 Ω	
	330 kΩ to 1.09 MΩ	0.015 % + 43 Ω	
	(1.1 to 3.29) MΩ	0.013 % + 43 Ω	
	(3.3 to 10.9) MΩ	0.047 % + 430 Ω	
	(11 to 32.9) MΩ	0.078 % + 430 Ω	
	(33 to 109.9) MΩ	0.39 % + 4.3 kΩ	
	(110 to 330) MΩ	0.39 % + 13 kΩ	
Fixed Points	0 Ω	40 μΩ	Fluke 5700A
	1 Ω	86 μΩ/Ω	
	1.9 Ω	85 μΩ/Ω	
	10 Ω	26 μΩ/Ω	
	19 Ω	25 μΩ/Ω	
	100 Ω	16 μΩ/Ω	
	190 Ω	16 μΩ/Ω	
	1 kΩ	12 μΩ/Ω	
	1.9 kΩ	12 μΩ/Ω	
	10 kΩ	11 μΩ/Ω	
	19 kΩ	11 μΩ/Ω	
	100 kΩ	12 μΩ/Ω	
	190 kΩ	17 μΩ/Ω	
	1 MΩ	30 μΩ/Ω	
	1.9 MΩ	41 μΩ/Ω	
	10 MΩ	48 μΩ/Ω	
19 MΩ	70 μΩ/Ω		
100 MΩ	0.018 %		

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Generate			
(0.22 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 > 500 kHz to 1 MHz	0.051 % + 4 μV 0.028 % + 4 μV 0.022 % + 4 μV 0.038 % + 4 μV 0.076 % + 6 μV 0.1 % + 12 μV 0.14 % + 23 μV 0.28 % + 23 μV	Fluke 5700A
(2.2 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 > 500 kHz to 1 MHz	0.051 % + 4 μV 0.028 % + 4 μV 0.022 % + 4 μV 0.038 % + 4 μV 0.076 % + 5 μV 0.10 % + 10 μV 0.14 % + 20 μV 0.28 % + 20 μV	
(22 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 > 500 kHz to 1 MHz	0.051 % + 12 μV 0.028 % + 8 μV 0.022 % + 8 μV 0.029 % + 8 μV 0.070 % + 23 μV 0.086 % + 23 μV 0.14 % + 31 μV 0.28 % + 78 μV	
220 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 > 500 kHz to 1 MHz	0.047 % + 78 μV 0.015 % + 23 μV 0.0083 % + 5 μV 0.011 % + 16 μV 0.022 % + 62 μV 0.037 % + 0.16 mV 0.093 % + 0.31 mV 0.19 % + 0.78 mV	
(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	0.0047 % + 0.78 mV 0.014 % + 0.23 mV 0.007 % + 54 μV 0.011 % + 0.16 mV 0.022 % + 0.31 mV 0.047 % + 1.3 mV 0.11 % + 3.9 mV 0.23 % + 7.0 mV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Generate (cont)			
(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	0.047 % + 7.8 mV 0.014 % + 2.3 mV 0.0072 % + 0.78 mV 0.019 % + 3.1 mV 0.048 % + 7.8 mV 0.12 % + 85 mV 0.42 % + 85 mV 1.0 % + 170 mV	Fluke 5700A
(220 to 1100) V	50 Hz to 1 kHz	0.014 % + 3.1 mV	
AC Voltage ³ – Measure			
(1 to 10) mV	(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	0.038 % + 3 μV 0.028 % + 1.1 μV 0.035 % + 1.1 μV 0.12 % + 1.1 μV 0.58 % + 1.1 μV 4.6 % + 2 μV	HP 3458A
(10 to 100) mV	(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	0.018 % + 4 μV 0.018 % + 2 μV 0.018 % + 2 μV 0.035 % + 2 μV 0.093 % + 2 μV 0.35 % + 10 μV 1.2 % + 10 μV 1.8 % + 10 μV	
100 mV to 1 V	(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	0.01 % + 40 μV 0.01 % + 20 μV 0.017 % + 20 μV 0.035 % + 20 μV 0.093 % + 20 μV 0.35 % + 100 μV 1.2 % + 100 μV 1.7 % + 100 μV	
(1 to 10) V	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	0.009 % + 400 μV 0.009 % + 200 μV 0.017 % + 200 μV 0.035 % + 200 μV 0.093 % + 200 μV 0.35 % + 1 mV 1.2 % + 1 mV 1.7 % + 1 mV	

Parameter/Range	Frequency	CMC ^{2, 4, 6} (±)	Comments
AC Voltage ³ – Measure (cont)			
(10 to 100) V	(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	0.023 % + 4 mV 0.023 % + 2 mV 0.023 % + 2 mV 0.041 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV	HP 3458A
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz	0.048 % + 40 mV 0.048 % + 20 mV	
(700 to 10 000) V	60 Hz	0.14 % + 0.17 V	Vitretek 4700
(10 000 to 70 000) V	60 Hz	0.16 % + 1.4 V	Vitretek 4700 & Vitrek HVL-100
AC Current ³ – Generate			
Up to 220 µA	(10 to 20) Hz (> 20 to 40) Hz > 40 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	0.066 % + 20 nA 0.039 % + 20 nA 0.025 % + 20 nA 0.12 % + 40 nA 0.17 % + 80 nA	Fluke 5700A
(> 0.22 to 2.2) mA	(10 to 20) Hz (> 20 to 40) Hz > 40 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	0.062 % + 40 nA 0.033 % + 30 nA 0.013 % + 30 nA 0.054 % + 400 nA 0.14 % + 800 nA	Fluke 5700A
(2.2 to 22) mA	(10 to 20) Hz (> 20 to 40) Hz > 40 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	0.062 % + 400 nA 0.033 % + 300 nA 0.014 % + 300 nA 0.054 % + 4 µA 0.14 % + 8 µA	Fluke 5700A
(> 22 to 220) mA	(10 to 20) Hz (> 20 to 40) Hz > 40 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	0.062 % + 4 µA 0.033 % + 3 µA 0.014 % + 3 µA 0.054 % + 39 µA 0.14 % + 78 µA	Fluke 5700A
(> 220 to 330) mA	40 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	0.074 % + 31 µA 0.089 % + 78 µA 0.78 % + 160 µA	Fluke 5700A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Current ³ – Generate (cont)			
> 330 mA to 1.1 A	10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.14 % + 78 µA 0.05 % + 78 µA 0.47 % + 770 µA 1.9 % + 3.9 mA	Fluke 5522A
(>1.1 to 3.0) A	10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.14 % + 78 µA 0.05 % + 78 µA 0.47 % + 770 µA 1.9 % + 3.9 mA	Fluke 5522A
(3 to 11) A	45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz	0.05 % + 1.5 mA 0.08 % + 1.5 mA 2.3 % + 1.5 mA	Fluke 5522A
(> 11 to 20) A	40 Hz to 1 kHz 1 kHz to 5 kHz	0.051 % + 1 mA 2.3 % + 5 mA	Fluke 5700A/5220A Fluke 5522A
AC Current ³ – Generate Toroidal			
(> 1.65 to 110) A (> 110 to 550) A	(45 to 65) Hz (45 to 65) Hz	0.38 % + 0.58 A 0.29 % + 0.59 A	Fluke 55XXA & Fluke 5500A coil
(550 to 1000) A	(45 to 65) Hz	0.39 % + 0.58 A	Fluke 5522A, Fluke 5500A coil
AC Current ³ – Generate Non-Toroidal			
(> 1.65 to 110) A (> 110 to 550) A	(45 to 65) Hz (45 to 65) Hz	0.48 % + 0.58 A 0.43 % + 0.58 A	Fluke 5500A & Fluke 5500A coil
(550 to 1000) A	(45 to 65) Hz	0.67 % + 0.58 A	Fluke 5522A, Fluke 5500A Coil

Parameter/Range	Frequency	CMC ^{2, 4, 6} (±)	Comments
AC Current ³ – Measure			
(5 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.46 % + 30 nA 0.18 % + 30 nA 0.073 % + 30 nA 0.07 % + 30 nA	HP 3458A
100 µA to 1 mA	(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	0.46 % + 200 nA 0.17 % + 200 nA 0.07 % + 200 nA 0.035 % + 200 nA 0.07 % + 200 nA 0.46 % + 400 nA 0.64 % + 1.5 µA	
(1 to 10) mA	(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	0.47 % + 2 µA 0.18 % + 2 µA 0.07 % + 2 µA 0.035 % + 2 µA 0.07 % + 2 µA 0.47 % + 4 µA 0.64 % + 15 µA	
(10 to 100) mA	(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	0.47 % + 20 µA 0.18 % + 20 µA 0.07 % + 20 µA 0.035 % + 20 µA 0.07 % + 20 µA 0.47 % + 40 µA 0.64 % + 150 µA	
100 mA 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	0.47 % + 200 µA 0.2 % + 200 µA 0.11 % + 200 µA 0.13 % + 200 µA 0.35 % + 200 µA 1.2 % + 400 µA	
(> 1 to 20) A	(1 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz	0.063 % 0.043 % 0.058 %	HP 3458A & Y5020
(> 20 to 400) A	(45 to 65) Hz	1.5 % + 0.3 A	LEM HEME LH2040
(> 400 to 1000) A	(45 to 65) Hz	1.5 % + 3 A	

Parameter/Equipment	Frequency	CMC ^{2,4} (\pm)	Comments
Inductance³ – Generate 100 mH 500 mH 100 μ H to < 1 mH (> 1 to < 10) mH (> 10 to < 100) mH > 100 mH to 1 H	100 Hz to 10 kHz (100 to 1) kHz 1.0 kHz, 0.01 VAC 1.0 kHz, 0.01 VAC 0.50 kHz, 0.02 VAC 0.20 kHz, 0.02 VAC	$\pm 0.16 \text{ mH} + 0.6R$ $\pm 0.70 \text{ mH} + 0.6R$ $\pm 2.6 \% + 0.6R$ $\pm 2.3 \% + 0.6R$ $\pm 1.9 \% + 0.6R$ $\pm 0.95 \% + 0.6R$	Standard inductor Standard inductor Decade inductor
Inductance³ – Measure 1 mH to 1 H	1.0 kHz, 1.0 VAC	$\pm 0.086 \%$	GW Instek LCR-6300
Capacitance³ – Measure 1 nF to 1 μ F	1.0 kHz, 1.0 VAC	$\pm 0.058 \%$	GW Instek LCR-6300
AC Resistance³ – Measure 1 Ω to < 100 k Ω > 100 k Ω to 10 M Ω	1.0 kHz, 1.0 VAC 100 Hz, 1.0 VAC	$\pm 0.058 \%$ $\pm 0.058 \%$	GW Instek LCR-6300
Oscilloscopes – Leveled Sine Wave³ – Generate, 50 kHz Reference 5 mV to 5.5 V _(pk-pk) Flatness (Relative to 50 kHz Ref) Vertical Gain – DC Into 50 Ω Into 1 M Ω AC Into 50 Ω Into 1 M Ω Time Markers – Into 50 Ω	50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (0 to 2.2) V (0 to 33) V 1 mV to 2.2 V _(pk-pk) 1 mV to 105 V _(pk-pk)	$1.6 \% + 0.23 \text{ mV}$ $2.7 \% + 0.23 \text{ mV}$ $3.1 \% + 0.23 \text{ mV}$ $4.7 \% + 0.23 \text{ mV}$ $1.2 \% + 78 \mu\text{V}$ $1.6 \% + 78 \mu\text{V}$ $3.1 \% + 78 \mu\text{V}$ $0.19 \% + 31 \mu\text{V}$ $0.04 \% + 31 \mu\text{V}$ $0.19 \% + 31 \mu\text{V}$ $0.08 \% + 31 \mu\text{V}$	Fluke 55XXA/SC600 <i>t</i> is time in seconds

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments	
Electrical Simulation of RTD Indicating Devices ³ –				
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C 0.18 °C	Fluke 55XXA	
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C		
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.19 °C 0.03 °C 0.04 °C 0.05 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.18 °C		
Electrical Simulation of Thermocouple Indicating Devices ³ –				
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.45 °C 0.26 °C 0.26 °C 0.26 °C 0.28 °C		Fluke 55XXA
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.31 °C 0.26 °C 0.26 °C 0.27 °C 0.29 °C		
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.35 °C 0.27 °C 0.27 °C 0.32 °C 0.40 °C		
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.5 °C 0.36 °C 0.35 °C 0.39 °C		

Parameter/Range	Range	CMC ^{2,4,5} (±)	Comments
Electrical Simulation of Thermocouple Indicating Devices ³ – (Cont)			
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.43 °C 0.36 °C 0.37 °C 0.43 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.55 °C 0.32 °C 0.29 °C 0.28 °C	Fluke 55XXA

IV. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
RF Power – Measure			
(20 to -49) dBm (-49 to -55) dBm (-55 to -60) dBm	50 MHz to 26.5 GHz	0.2 dB 0.6 dB 2.2 dB	Agilent E4418A & E4413A
(20 to -17) dBm (-17 to -20) dBm	50 MHz to 39 GHz	0.20 dB 0.36 dB	Agilent E4418A & 8487A
(20 to -17) dBm (-17 to -20) dBm	(39 to 50) GHz	0.27 dB 0.36 dB	
RF Power – Measuring Equipment			
(+13 to -100) dBm	9 kHz to 2.5 GHz (2.5 to 3.2) GHz (3.2 to 4) GHz	1.2 dB 1.7 dB 2.3 dB	HP8648D

V. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2, 5, 6, 7} (±)	Comments
Air Velocity – Anemometers & Air Velocity Meters	(30 to 250) SFPM (0.15 to 1.25) m/s	(2.7 % + 2.3 + 0.6R) SFPM	Wind tunnel by differential method
	(250 to 1500) SFPM (1.25 to 7.5) m/s	(2.3 % + 6.2 + 0.6R) SFPM	
	(1500 to 9000) SFPM (7.5 to 45) m/s	(1.2 % + 21 + 0.6R) SFPM	

VI. Mechanical

Parameter/Equipment	Range	CMC ^{2, 5, 6, 7} (±)	Comments
Pressure/Vacuum ³	Pneumatic (0 to 15) psia (15 to 100) psia (0 to 10) in·H ₂ O	0.0046 psia + 0.6R	Ashcroft AQS pressure modules
		0.05 psia + 0.6R	
		0.01 in·H ₂ O + 0.6R	
	(10 to 250) in·H ₂ O	0.022 % + 0.6R	Ametek PKII DWT
	Hydraulic (-29.2 to -1) in·Hg (3 to 500) psig	0.012 % + 0.6R	GE P3025-3 DWT
		0.0093 % + 0.6R	
(200 to 10 000) psi		0.0098 % + 0.6R	
(> 10 000 to 16 000) psi	0.01 % + 250 Pa + 0.6R	SI Pressure Inst. M9180/4 DWT	
Torque Transducers ³ – Measuring Devices	(5 to 50) lbf · in (50 to 250) lbf · in	0.0010 lbf · in 0.013 lbf · in	5” Torque Wheel & mass pieces
Torque ³ – Measuring Devices	(5 to 10) lbf · in (10 to 240) lbf · in (20 to 100) lbf · ft (100 to 200) lbf · ft (200 to 1000) lbf · ft	1.2 % + 0.6R 1.2 % + 0.6R 0.7 % + 0.6R 1.2 % + 0.6R 0.62 % + 0.6R	Torque transducers

Parameter/Equipment	Range	CMC ^{2, 5, 6} (\pm)	Comments
Handheld Force Gages ³ (Tension)	(0 to 10) lbf (0 to 4.535 92) kgf	0.5 gf + 0.6R	NIST Class F weights
	(10 to 100) lbf (4.535 92 to 45.3592) kgf	4.8 gf + 0.6R	
Balances/Scales ³	Up to 50 g	0.13 mg	ASTM Class 0 weights
	(50 to 100) g	0.15 mg	
	(100 to 200) g	0.25 mg	
	(200 to 300) g	0.3 mg	
	(300 to 410) g	0.41 mg	
	(410 to 750) g	0.69 mg	ASTM Class 1 weights
	(750 to 1000) g	0.8 mg	
	(1 to 1.8) kg	1.1 mg	
	(1.8 to 5) kg	210 mg	ASTM Class 1 & Class 2 weights
	(5 to 10) kg	0.73 g	NIST Class F weights
(10 to 25) kg	1.9 g		
(25 to 50) kg	4.5 g		
(50 to 120) kg	8.6 g		
Up to 50 lb (22.6796) kg	2.7 g	ASTM Class 0 weights	
(50 to 100) lb (22.6796 to 45.3592) kg	3.8 g	ASTM Class 1 weights	
(100 to 200) lb (45.3592 to 90.7185) kg	5.8 g	ASTM Class 1 & Class 2 weights	
(200 to 300) lb (90.7185 to 136.078) kg	7.4 g	NIST Class F weights	

VII. Thermodynamic

Parameter/Equipment	Range	CMC ^{2, 5, 7} (\pm)	Comments
Temperature ³ – Measure	(-196 to 0) °C (> 0 to 100) °C (> 100 to 420) °C (> 420 to 660) °C	0.013 °C 0.0071 °C 0.015 °C 0.035 °C	Fluke 5626 PRT, IsoTECH Milli-K
Temperature ³ – Measuring Equipment	-196 °C (-20 to 100) °C (> 100 to 150) °C (> 150 to 400) °C (> 400 to 650) °C	0.013 °C + 0.6R 0.017 °C + 0.6R 0.021 °C + 0.6R 0.12 °C + 0.6R 0.12 °C + 0.6R	LN ₂ , Fluke 5626 PRT, IsoTECH Milli-K Fluke 5626 PRT, IsoTECH Milli-K, Temperature Baths/Dry Blocks
Infrared Radiation Thermometry ³	35 °C (> 35 to 100) °C (> 100 to 200) °C (> 200 to 350) °C (> 350 to 500) °C	0.49 °C + 0.6R 0.71 °C + 0.6R 1.0 °C + 0.6R 1.7 °C + 0.6R 2.2 °C + 0.6R	Fluke 4181 black body $\epsilon = 0.9$ to 1.0 $\lambda = (8$ to $14) \mu\text{m}$
Humidity ³ – Measuring Equipment (15 to 35) °C	(10 to 20) % RH (> 20 to 50) % RH (> 50 to 95) % RH	0.60 % RH 0.72 % RH 0.90 % RH	Thunder Scientific 1200

VIII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 5, 7} (\pm)	Comments
Frequency ³ – Measure	0.1 Hz to 3 GHz	1.1×10^{-10} Hz/Hz	HP 53132A & Spectracomm 8194B
Frequency ³ – Measuring Equipment	0.001 Hz to 9 kHz 9 kHz to 4 GHz	1.1×10^{-10} Hz/Hz 1.1×10^{-10} Hz/Hz	HP33250A & Spectracomm 8194B HP8648D & Spectracomm 8194B
Stopwatches & Timers ³	32.768 kHz \pm 1 % Up to 19.99 s/day	0.37 Hz 0.037 s/day	Frequency counter timometer

SATELLITE

INDUSTRIAL PROCESS MEASUREMENT, INC.
 229 Shellyland Rd, Unit 5A,
 Manheim, PA 17545
 Ray Ditzler Phone: 717 492 8549

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage ³ – Measuring Equipment	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	47 μV/V + 2 μV 42 μV/V + 4 μV 39 μV/V + 39 μV 43 μV/V + 0.39 mV 43 μV/V + 1.2 mV	Fluke 5500A
DC Voltage ³ – Measure	10 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	13 μV/V + 0.30 μV 12 μV/V + 0.30 μV 12 μV/V + 0.50 μV 14 μV/V + 30 μV 14 μV/V + 100 μV	Agilent 3458A Add [12 μV/V (Vin/1000)*2] additional error for inputs > 100 V.
DC Current ³ – Measuring Equipment	(0 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (.33 to 2.2) A (2.2 to 11) A	101 μA/A + 0.04 μA 78 μA/A + 0.19 μA 78 μA/A + 2.6 μA 233 μA/A + 34 μA 466 μA/A + 256 μA	Fluke 5500A
DC Current ³ – Measure	(10 to 100) nA 100 nA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	48 μA/A + 40 pA 29 μA/A + 40 pA 34 μA/A + 0.1 nA 29 μA/A + 0.8 nA 30 μA/A + 5 nA 29 μA/A + 50 nA 47 μA/A + 0.5 μA 140 μA/A + 10 μA	Agilent 3458A

Parameter/Equipment	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Measuring Equipment			
(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	0.28 % + 16 µV 0.12 % + 16 µV 0.16 % + 16 µV 0.20 % + 16 µV 0.28 % + 26 µV 0.78 % + 47 µV	Fluke 5500A
(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	0.20 % + 39 µV 0.039 % + 16 µV 0.078 % + 16 µV 0.13 % + 31 µV 0.19 % + 130 µV 0.55 % + 260 µV	
330 mV to 3.3 V	(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	0.12 % + 200 µV 0.024 % + 47 µV 0.062 % + 47 µV 0.11 % + 240 µV 0.19 % + 1.4 mV 0.39 % + 2.6 mV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.12 % + 2.0 mV 0.031 % + 470 µV 0.062 % + 2.1 mV 0.15 % + 3.9 mV 0.19 % + 14 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.039 % + 5.2 mV 0.062 % + 12 mV 0.070 % + 26 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.070 % + 62 mV 0.16 % + 78 mV 0.16 % + 390 mV	

Parameter/Equipment	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Measure			
(1 to 10) mV	(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	0.035 % + 3 μV 0.023 % + 1.1 μV 0.035 % + 1.1 μV 0.12 % + 1.1 μV 0.58 % + 1.1 μV 4.7 % + 2 μV	Agilent 3458A
(10 to 100) mV	(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	0.008 % + 4 μV 0.008 % + 2 μV 0.016 % + 2 μV 0.035 % + 2 μV 0.093 % + 2 μV 0.35 % + 10 μV 1.2 % + 10 μV 1.8 % + 10 μV	
100 mV to 1 V	(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	0.008 % + 40 μV 0.008 % + 20 μV 0.016 % + 20 μV 0.035 % + 20 μV 0.093 % + 20 μV 0.35 % + 100 μV 1.2 % + 100 μV 1.8 % + 100 μV	
(1 to 10) V	(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	0.008 % + 40 μV 0.008 % + 200 μV 0.016 % + 200 μV 0.035 % + 200 μV 0.093 % + 200 μV 0.35 % + 1 mV 1.2 % + 1 mV 1.8 % + 1 mV	
(10 to 100) V	(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	0.023 % + 4 mV 0.023 % + 2 mV 0.023 % + 2 mV 0.041 % + 2 mV 0.14 % + 10 mV 0.47 % + 10 mV 1.7 % + 10 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.046 % + 40 mV 0.046 % + 20 mV 0.070 % + 20 mV 0.14 % + 20 mV 0.35 % + 20 mV	

Parameter/Equipment	Frequency	CMC ^{2, 4} (±)	Comments
AC Current ³ – Measuring Equipment			
(29 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.19 % + 0.12 μA 0.10 % + 0.12 μA 0.10 % + 0.19 μA 0.31 % + 0.12 μA 0.97 % + 0.12 μA	Fluke 5500A
(0.33 to 3.3) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.16 % + 0.24 μA 0.08 % + 0.24 μA 0.08 % + 0.24 μA 0.16 % + 0.24 μA 0.47 % + 0.24 μA	
(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	0.16 % + 2.4 μA 0.08 % + 2.4 μA 0.07 % + 2.4 μA 0.16 % + 2.4 μA 0.47 % + 2.4 μA	
(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	0.16 % + 24 μA 0.08 % + 24 μA 0.07 % + 24 μA 0.16 % + 24 μA 0.47 % + 24 μA	
(0.33 to 2.2) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.16 % + 240 μA 0.08 % + 240 μA 0.58 % + 240 μA	
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	0.05 % + 1.6 mA 0.08 % + 1.6 mA 0.26 % + 1.6 mA	
AC Current ³ – Measure			
(5 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.47 % + 0.03 μA 0.18 % + 0.03 μA 0.070 % + 0.03 μA 0.070 % + 0.03 μA	Agilent 3458A
(0.1 to 1) mA	(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	0.47 % + 0.2 μA 0.18 % + 0.2 μA 0.070 % + 0.2 μA 0.035 % + 0.2 μA 0.070 % + 0.2 μA 0.47 % + 0.4 μA 0.64 % + 1.5 μA	

Parameter/Equipment	Frequency	CMC ^{2,4} (±)	Comments
AC Current ³ – Measure (cont)			
(1 to 10) mA	(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	0.47 % + 2 μA 0.18 % + 2 μA 0.070 % + 2 μA 0.035 % + 2 μA 0.070 % + 2 μA 0.47 % + 4 μA 0.64 % + 15 μA	Agilent 3458A
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (100 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.47 % + 20 μA 0.18 % + 20 μA 0.070 % + 20 μA 0.035 % + 20 μA 0.070 % + 20 μA 0.47 % + 40 μA 0.64 % + 150 μA	
100 mA 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	0.47 % + 200 μA 0.19 % + 200 μA 0.093 % + 200 μA 0.12 % + 200 μA 0.35 % + 200 μA 1.2 % + 400 μA	
Resistance ³ – Measuring Equipment	(0 to 10.9) Ω (11 to 32.9) Ω (33 to 109.9) Ω (110 to 329.9) Ω 330 Ω to 1.09 kΩ (1.1 to 3.29) kΩ (3.3 to 10.9) kΩ (11 to 32.9) kΩ (33 to 109.9) kΩ (110 to 329) kΩ 330 kΩ to 1.09 MΩ (1.1 to 3.29) MΩ (3.3 to 10.9) MΩ (11 to 32.9) MΩ (33 to 109.9) MΩ (110 to 330) MΩ	94 μΩ/Ω + 0.006 Ω 94 μΩ/Ω + 0.012 Ω 70 μΩ/Ω + 0.012 Ω 70 μΩ/Ω + 0.012 Ω 70 μΩ/Ω + 0.05 Ω 70 μΩ/Ω + 0.05 Ω 70 μΩ/Ω + 0.5 Ω 70 μΩ/Ω + 0.5 Ω 86 μΩ/Ω + 5 Ω 93 μΩ/Ω + 5 Ω 0.012 % + 43 Ω 0.012 % + 43 Ω 0.047 % + 430 Ω 0.078 % + 430 Ω 0.39 % + 4.3 kΩ 0.39 % + 13 kΩ	Fluke 5500A

Parameter/Equipment	Frequency	CMC ^{2, 4} (±)	Comments	
Resistance ³ – Measure	(0 to 10) Ω (10 to 100) Ω (100 to 1000) Ω (1 to 10) kΩ (10 to 100) kΩ 1 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	23 μΩ/Ω + 50 μΩ 17 μΩ/Ω + 500 μΩ 15 μΩ/Ω + 500 μΩ 15 μΩ/Ω + 5 mΩ 15 μΩ/Ω + 50 mΩ 15 μΩ/Ω + 2.0 mΩ 66 μΩ/Ω + 100 mΩ 0.58 mΩ/Ω + 1 kΩ 5.8 kΩ/Ω + 10 kΩ	Agilent 3458A	
Capacitance ³ – Measuring Equipment	(0.33 to 0.4999) nF (0.5 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.99) nF (110 to 329.99) nF (0.33 to 1.0999) μF (1.1 to 3.2999) μF (3.3 to 10.999) μF (11 to 32.999) μF (33 to 109.99) μF (110 to 329.99) μF 330 μF to 1.1 mF	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 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (10 to 50) Hz (10 to 20) Hz	0.39 % + 0.01 nF 0.39 % + 0.01 nF 0.39 % + 0.01 nF 0.20 % + 0.01 nF 0.20 % + 0.1 nF 0.20 % + 0.1 nF 0.20 % + 0.2 nF 0.20 % + 1 nF 0.28 % + 2 nF 0.28 % + 8 nF 0.32 % + 23 nF 0.39 % + 78 nF 0.54 % + 230 nF 0.78 % + 1 μF	Fluke 5500A

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical simulation of Thermocouple Indicating Devices ³ – Measuring Equipment & Measure			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.45 °C 0.26 °C 0.26 °C 0.26 °C 0.28 °C	Fluke 5500A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (-150 to 760) °C (760 to 1200) °C	0.31 °C 0.26 °C 0.26 °C 0.27 °C 0.29 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.35 °C 0.27 °C 0.26 °C 0.31 °C 0.39 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.51 °C 0.37 °C 0.35 °C 0.39 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.44 °C 0.37 °C 0.37 °C 0.43 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.54 °C 0.30 °C 0.26 °C 0.26 °C	
Electrical Simulation of RTD Indicating Devices ³ – Measuring Equipment			
Pt 385, 100 Ω	(-200 to -100) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.039 °C 0.055 °C 0.070 °C 0.078 °C 0.093 °C 0.18 °C	Fluke 5500A

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical simulation of RTD Indicating Devices ³ – Measuring Equipment (cont)			
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.039 °C 0.055 °C 0.070 °C 0.078 °C 0.093 °C	Fluke 5500A
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.20 °C 0.032 °C 0.039 °C 0.047 °C 0.055 °C 0.062 °C 0.070 °C 0.078 °C 0.039 °C	
DC Power ³ – Measuring Equipment			
(3.3 to 8.999) mA (9 to 32.999) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 11) A	1.089 μW to 9.18 W 297 μW to 33.7 W 1.089 mW to 91.8 W 2.97 mW to 337 W 10.89 mW to 918 W 29.7 mW to 2.244 kW 72.6 mW to 4.59 kW 148.5 mW to 11.22 kW	0.035 % of output 0.028 % of output 0.035 % of output 0.028 % of output 0.064 % of output 0.049 % of output 0.096 % of output 0.074 % of output	Fluke 5500A
AC Power ³ – Measuring Equipment			
(45 to 65 Hz)			
33 to 329.999 mV (3.3 to 8.999) mA 33 to 329.999 mV (9 to 32.999) mA 33 to 329.999 mV (33 to 89.99) mA 33 to 329.999 mV (90 to 329.99) mA 33 to 329.999 mV (0.33 to 0.8999) A 33 to 329.999 mV (0.9 to 2.1999) A 33 to 329.999 mV (2.2 to 4.4999) A	108.9 μW to 2.97 mW 297 μW to 10.89 mW (1.08 to 29.7) mW (2.97 to 108.9) mW (10.89 to 297) mW (297 to 726) mW 72.6 mW to 1.485 W	0.32 % of output 0.21 % of output 0.28 % of output 0.21 % of output 0.34 % of output 0.24 % of output 0.29 % of output	Fluke 5500A

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
AC Power ³ – Measuring Equipment (cont)			
33 to 329.999 mV (4.5 to 11) A	148.5 mW to 3.63 W	0.21 % of output	Fluke 5500A
330mV to 1020V (3.3 to 8.999) mA	1.089 mW to 9.18 W	0.20 % of output	
330mV to 1020V (9 to 32.999) mA	2.97 mW to 33.7 W	0.13 % of output	
330mV to 1020V (33 to 89.99) mA	10.89 mW to 91.8 W	0.20 % of output	
330mV to 1020V (90 to 329.99) mA	29.7 mW to 337 W	0.14 % of output	
330mV to 1020V (0.33 to 0.8999) A	108.9 mW to 918 W	0.28 % of output	
330mV to 1020V (0.9 to 2.1999) A	297 mW to 2.244 kW	0.18 % of output	
330mV to 1020V (2.2 to 4.4999) A	726 mW to 4.59 kW	0.18 % of output	
330mV to 1020V (4.5 to 11) A	1.485 W to 11.22 kW	0.14 % of output	

Parameter/Equipment	Frequency	CMC ^{2,4} (±)	Comments
Oscilloscopes –			
Leveled Sine Wave ³ –Generate, 50 kHz Reference 5 mV to 5.5 V _(pk-pk)	50 kHz 50 kHz to 100 MHz (100 to 300) MHz	1.6 % + 0.16 mV 2.7 % + 0.23 mV 3.1 % + 0.23 mV	Fluke 55XXA/SC300
Flatness (Relative to 50 kHz Ref)	50 kHz to 100 MHz (100 to 300) MHz	1.2 % + 78 μV 1.6 % + 78 μV	
Vertical Gain – DC			
Into 50 Ω	(0 to 2.2) V	0.19 % + 78 μV	
Into 1 MΩ	(0 to 33) V	0.19 % + 78 μV	
AC			
Into 50 Ω	4.5 mV to 2.2 V _(pk-pk)	0.19 % + 78 μV	
Into 1 MΩ	4.5 mV to 105 V _(pk-pk)	0.19 % + 78 μV	
Time Markers – Into 50 Ω	5s to 100 μs (50 to 2) μs 1 μs to 20 ns (10 to 2) ns	19 μs/s + (0.76t) μs/s 19 μs/s + 12 ms 19 μs/s 19 μs/s	

II. MRF Electrical

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
RF Power ³ – Measuring Equipment	(-100 to 13) dBm 9 kHz to 2.1 GHz	2.4 dB	RF Signal Generator

III. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Frequency ³ – Measuring Equipment	(0.01 to 120) Hz 120 Hz to 1.2 kHz (1.2 to 12) kHz (12 to 120) kHz 120 kHz to 1.2 MHz (1.2 to 2) MHz	20 µHz/Hz + 1 mHz 19 µHz/Hz + 1 mHz 19 µHz/Hz + 1 mHz 19 µHz/Hz + 12 mHz 19 µHz/Hz + 12 mHz 19 µHz/Hz + 12 mHz	Fluke 5500A

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

² Calibration and Measurement Capability Uncertainty (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. CMCs 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. 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 The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

⁵ In the statement of CMC, R is the resolution of the unit under test (same unit as the CMC uncertainty). In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches.

⁶ In the statement of CMC, % refers to % of reading unless otherwise noted.

⁷ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

⁸ This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

INDUSTRIAL PROCESS MEASUREMENT, INC.

Edison, NJ

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCCL Z540-1-1994 and R205 – *Specific Requirements: Calibration Laboratory Accreditation Program*. 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 April 2017).



Presented this 23rd day of January 2023.

A blue ink signature of Mr. Trace McInturff, written over a horizontal line.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2733.01
Valid to December 31, 2024

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