SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
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CALIBRATION

Valid To: April 30, 2024 Certificate Number: 1894.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 11]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Plain Ring Gages	(0.04 to 1) in (1 to 3) in (3 to 8) in	(12 + 0.4*L*) µin (12 + 0.3*L*) µin (11 + 0.5*L*) µin	Universal measuring machine
Adjustable Thread Ring Gages –			
Pitch Diameter	Up to 1.5 in	80 µin	Ring is sized to a setting plug & the uncertainty reported is for the plug
Minor Diameter	Up to 1.5 in	(16 + 1.8*D*) µin	Go/No Go check; uncertainty reported is for the plug

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Micrometers[3] –	Up to 4 in (4 to 24) in (24 to 60) in	(31 + 1.5*L*) µin (65 + 3*L*) µin (310 + 2.5*L*) µin	Gage blocks
Flatness of Anvils	Up to 1 in diameter	9 µin	Optical flat
Anvil Parallelism	Up to 1 in (> 1 to 4) in (> 4 to 24) in (> 24 to 60) in	32 µin (31 + 1.5*L*) µin (65 + 3*L*) µin (310 + 2.5*L*) µin	Ball gage Gage blocks
Calipers[3] (OD, ID, Depth, Step)	Up to 4 in (4 to 24) in (24 to 60) in	(290 + 0.1*L*) µin (290 + 0.9*L*) µin (310 + 2.5*L*) µin	Gage blocks
Gage Blocks –	(0.005 to 4) in (> 4 to 20) in	(3.1 + 1.1*L*) µin (2 + 3.5*L*) µin	Gage block comparator, ULM & master gauge blocks
Parallelism (Variation in Length)	(0.005 to 4) in (> 4 to 20) in	2.3 µin 4.2 µin	
Height Gages	Up to 40 in	(190 + 1.8*L*) µin	Gage blocks
Dial Indicators[3]	Up to 6 in	(6 + 2.9*L*) µin	Universal measuring machine
Thread Plugs –			
Pitch Diameter	Up to 6 in	80 µin	Universal measuring machine with thread wires & plain plug gages
Major Diameter	Up to 6 in	(16 + 1.8*D*) µin	
Tapered Thread Plugs –			
Pitch Diameter	Up to 3 in	100 µin	Universal measuring machine with thread wires, tapered sine block, gage block, surface plate & dial indicator
Major Diameter	Up to 3 in	(75 + 0.7*D*) µin	
Notch Height	Up to 1 in	130 µin	

Parameter/Equipment	Range[5]	CMC[2, 5] (±)	Comments
Plain Plugs, Disks, Thread Wires	Up to 8 in	(16 + 1.8*D*) µin	Universal measuring machine
Length Standards	Up to 8 in (8 to 24) in (22 to 40) in	(4 + 3.2*L*) µin (2 + 3.5*L*) µin (7 + 3.7*L*) µin	Universal measuring machine, gage blocks, indicator & surface plate
Steel Rules	Up to 40 in (40 to 72) in	0.0024 in 0.0033 in	Glass scale
Surface Plates[3] –			
Overall Flatness	Up to 225 in *DL*	12$\sqrt{DL}$ µin	Precision level system
Local Variation in Flatness	Up to 225 in *DL*	31 µin	Repeat-o-meter

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
DC Voltage – Generate[3]	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	6 µV/V + 0.4 µV 3.5 µV/V + 0.7 µV 2.5 µV/V + 2.5 µV 2.5 µV/V + 4 µV 3.5 µV/V + 40 µV 4.5 µV/V + 0.4 mV	Fluke 5700A/EP
DC Voltage – Generate			
Fixed Points	10 V	0.5 µV/V	Fluke 732A
	±100 mV ±1 V ±10 V ±100 V ±1000 V	1.5 µV/V 0.5 µV/V 0.5 µV/V 0.6 µV/V 0.7 µV/V	Fluke 732A/752A

Parameter/Equipment	Range	CMC[2, 6, 7, 9] (±)	Comments
DC Voltage – Measure[3]	(0 to 200) mV (0 to 2) V (0 to 20) V (0 to 200) V (0 to 1050) V (1 to 10) kV (10 to 35) kV	5.2 µV/V + 0.1 µV 3.5 µV/V + 0.4 µV 3.5 µV/V + 4 µV 5.5 µV/V + 40 µV 5.5 µV/V + 0.5 mV 0.034 % + 0.034 V 0.035 % + 0.07 V	Fluke 8508A Vitrek 4700/HVP-35
DC Voltage – Measure Fixed Points	10 V ±100 mV ±1 V ±10 V ±100 V ±1000 V	0.3 µV/V 1.5 µV/V 0.5 µV/V 0.5 µV/V 0.6 µV/V 0.7 µV/V	Fluke 732A Fluke 732A/752A/ 5720A
DC Current – Generate[3]	(0 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (0 to 220) µA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.2 to 11) A (11 to 20.5) A (20 to 1000) A	5.9 µA/A + 1 nA 6.1 µA/A + 5.3 nA 6.1 µA/A + 50 nA 8.8 µA/A + 0.3 µA 14 µA/A + 7 µA 35 µA/A + 6 nA 30 µA/A + 7 nA 30 µA/A + 40 nA 40 µA/A + 0.7 µA 60 µA/A + 12 µA 0.034 % + 0.48 mA 0.1 % + 750 µA 0.55 %	Fluke 5700A/EP characterized with HP 3458A & standard resistors Fluke 5700A/EP Fluke 5520A Fluke 5520A with 5500/coil
DC Current – Measure[3]	(0 to 200) µA (0 to 2) mA (0 to 20) mA (0 to 200) mA (0 to 2) A (0 to 20) A	12 µA/A + 0.4 nA 12 µA/A + 4 nA 14 µA/A + 40 nA 48 µA/A + 0.8 µA 0.019 % + 16 µA 0.04 % + 0.4 mA	Fluke 8508A

Parameter/Equipment	Range	CMC[2, 6, 9] (±)	Comments
Resistance – Generate[3]			
Fixed Points	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1.9 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	40 µΩ 80 µΩ/Ω 80 µΩ/Ω 21 µΩ/Ω 21 µΩ/Ω 7.5 µΩ/Ω 7.5 µΩ/Ω 7.5 µΩ/Ω 7.5 µΩ/Ω 9 µΩ/Ω 9 µΩ/Ω 15 µΩ/Ω 16 µΩ/Ω 31 µΩ/Ω 39 µΩ/Ω 95 µΩ/Ω	Fluke 5700A/EP
Resistance – Generate[3]	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω 110 Ω to 1.1 kΩ (1.1 to 11) kΩ (11 to 110) kΩ 110 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 to 1100) MΩ	40 µΩ/Ω + 1 mΩ 30 µΩ/Ω + 1.5 mΩ 28 µΩ/Ω + 1.4 mΩ 28 µΩ/Ω + 2 mΩ 28 µΩ/Ω + 20 mΩ 28 µΩ/Ω + 200 mΩ 32 µΩ/Ω + 2 Ω 60 µΩ/Ω + 30 Ω 0.013 % + 50 Ω 0.025 % + 2.5 kΩ 0.05 % + 3 kΩ 0.3 % + 100 kΩ 1.5 % + 500 kΩ	Fluke 5520A

Parameter/Equipment	Range	CMC[2, 6, 7, 9] (±)	Comments
Resistance – Measure/Generate	(0.0001 to 0.001) Ω (0.001 to 0.01) Ω (0.01 to 0.1) Ω (0.1 to 1) Ω	1.5 μΩ/Ω 1.1 μΩ/Ω 0.7 μΩ/Ω 0.4 μΩ/Ω	MIL 6010B/6011A or 6000B
Fixed Point	1 Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ	0.12 μΩ/Ω 0.17 μΩ/Ω 0.24 μΩ/Ω 0.28 μΩ/Ω	Thomas-type resistors
Fixed Point	10 kΩ (1 to 13) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (1 to 10) MΩ (10 to100) MΩ 100 MΩ 1 GΩ (1 to 10) GΩ (10 to 100) GΩ 100 GΩ to 1 TΩ (1 to 10) TΩ	0.15 μΩ/Ω 0.33 μΩ/Ω 0.45 μΩ/Ω 0.56 μΩ/Ω 0.79 μΩ/Ω 3.8 μΩ/Ω 5 μΩ/Ω 10 μΩ/Ω 20 μΩ/Ω 50 μΩ/Ω 0.01 % 0.035 %	Evanohm-type resistors Guarded dual source bridge
Resistance – Measure[3]	(0 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 (2 to 20) GΩ	17 μΩ/Ω + 4 μΩ 9.5 μΩ/Ω + 14 μΩ 8 μΩ/Ω + 50 μΩ 8 μΩ/Ω + 0.5 mΩ 8 μΩ/Ω + 5 mΩ 8 μΩ/Ω + 50 mΩ 9 μΩ/Ω + 1 Ω 17 μΩ/Ω + 10 Ω 65 μΩ/Ω + 1 kΩ 0.018 % + 100 kΩ 0.16 % + 10 MΩ	Fluke 8508A
Electrical Calibration of RTD Indicators & Indicating Systems[3] –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C	Fluke 5520A/8508A

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Electrical Calibration of RTD Indicators & Indicating Systems[3] – (cont)			
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C	Fluke 5520A/8508A
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	0.25 °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	
Pt 385, 200 Ω	(-200 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	0.04 °C 0.04 °C 0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	
Pt 385, 500 Ω	(-200 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	0.04 °C 0.05 °C 0.05 °C 0.06 °C 0.08 °C 0.08 °C 0.09 °C 0.11 °C	
Pt 385, 1000 Ω	(-200 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	0.03 °C 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.07 °C 0.23 °C	

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Electrical Calibration of RTD Indicators & Indicating Systems[3] – (cont)			
PtNi 385, 120 Ω (Ni 120)	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.08 °C 0.08 °C 0.14 °C	Fluke 5520A/8508A
Cu 427, 10 Ω	(-100 to 260) °C	0.3 °C	
Electrical Calibration of Thermocouple Indicators & Indicating Systems[3] –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.44 °C 0.34 °C 0.3 °C 0.33 °C	Fluke 5520A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.3 °C 0.26 °C 0.31 °C 0.5 °C 0.84 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C	

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Electrical Calibration of Thermocouple Indicators & Indicating Systems[3] (cont) –			
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.37 °C 0.26 °C 0.17 °C	Fluke 5520A
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C 120 to 410) °C (410 to 1300) °C	0.4 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.57 °C 0.35 °C 0.33 °C 0.4 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.56 °C 0.27 °C	

	Voltage	Current (A)	Output Power (W)	(±) CMC[2, 6, 7 8]
DC Power – Generate	33 mV	0.33 mA	11 µW	0.03 %
		3.299 99 mA	109 µW	0.01 %
		3.3 mA	109 µW	0.02 %
		32.9999 mA	1.1 mW	0.01 %
		33 mA	1.1 mW	0.02 %
		329.999 mA	11 mW	0.01 %
		0.33 A	11 mW	0.03 %
		1.09999 A	36 mW	0.02 %
		1.1 A	36 mW	0.04 %
		2.999 99 A	99 mW	0.04 %
		3 A	99 mW	0.07 %
		10.9999 A	363 mW	0.05 %
		11 A	363 mW	0.11 %
		20.5 A	677 mW	0.10 %
	329.9999 mV	0.33 mA	109 µW	0.03 %
		3.299 99 mA	1.1 mW	0.01 %
		3.3 mA	1.1 mW	0.02 %
		32.9999 mA	11 mW	0.01 %
		33 mA	11 mW	0.02 %
		329.999 mA	109 mW	0.01 %
		0.33 A	109 mW	0.03 %
		1.09999 A	363 mW	0.02 %
		1.1 A	363 mW	0.04 %
		2.999 99 A	1 W	0.04 %
		3 A	1 W	0.07 %
		10.9999 A	3.6 W	0.05 %
		11 A	3.6 W	0.11 %
		20.5 A	6.8 W	0.10 %
	0.33 V	0.33 mA	109 mW	0.03 %
		3.299 99 mA	1.1 mW	0.01 %
		3.3 mA	1.1 mW	0.02 %
		32.9999 mA	11 mW	0.01 %
		33 mA	11 mW	0.02 %
		329.999 mA	109 mW	0.01 %
		0.33 A	109 mW	0.03 %
		1.099 99 A	363 mW	0.02 %
		1.1 A	363 mW	0.04 %
		2.999 99 A	1 W	0.04 %
		3 A	1 W	0.07 %
		10.9999 A	3.6 W	0.05 %
		11 A	3.6 W	0.11 %
		20.5 A	6.8 W	0.10 %
Comments		Fluke 5520A		

	Voltage	Current (A)	Output Power (W)	(±) CMC[2, 6, 7, 8]
DC Power – Generate (cont)	3.299 999 V	0.33 mA	1.1 mW	0.03 %
		3.299 99 mA	10.9 mW	0.01 %
		3.3 mA	10.9 mW	0.02 %
		32.9999 mA	109 mW	0.01 %
		33 mA	109 mW	0.02 %
		329.999 mA	1.1 W	0.01 %
		0.33 A	1.1 W	0.03 %
		1.099 99 A	3.6 W	0.02 %
		1.1 A	3.6 W	0.04 %
		2.999 99 A	9.9 W	0.04 %
		3 A	9.9 W	0.07 %
		10.9999 A	36 W	0.05 %
		11 A	36 W	0.11 %
		20.5 A	68 W	0.10 %
	3.3 V	0.33 mA	1.1 mW	0.03 %
		3.299 99 mA	11 mW	0.01 %
		3.3 mA	10.9 mW	0.02 %
		32.9999 mA	109 mW	0.01 %
		33 mA	109 mW	0.02 %
		329.999 mA	1.1 W	0.01 %
		0.33 A	1.1 W	0.03 %
		1.099 99 A	3.6 W	0.02 %
		1.1 A	3.6 W	0.04 %
		2.999 99 A	9.9 W	0.04 %
		3 A	9.9 W	0.07 %
		10.9999 A	36 W	0.05 %
		11 A	36 W	0.11 %
		20.5 A	68 W	0.10 %
	32.999 99 V	0.33 mA	11 mW	0.03 %
		3.299 99 mA	0.1 W	0.01 %
		3.3 mA	109 mW	0.02 %
		32.9999 mA	1.1 W	0.01 %
		33 mA	1.1 W	0.02 %
		329.999 mA	10.9 W	0.01 %
		0.33 A	10.9 W	0.03 %
		1.099 99 A	36.3 W	0.02 %
		1.1 A	36.3 W	0.04 %
		2.999 99 A	99 W	0.04 %
		3 A	99 W	0.07 %
		10.9999 A	363 W	0.05 %
		11 A	363 W	0.11 %
		20.5 A	676 W	0.10 %
Comments		Fluke 5520A		

	Voltage	Current (A)	Output Power (W)	(±) CMC[2, 6, 7, 8]
DC Power – Generate (cont)	33 V	0.33 mA	11 mW	0.03 %
		3.299 99 mA	0.1 W	0.01 %
		3.3 mA	109 mW	0.02 %
		32.9999 mA	1.1 W	0.01 %
		33 mA	1.1 W	0.02 %
		329.999 mA	10.9 W	0.01 %
		0.33 A	10.9 W	0.03 %
		1.099 99 A	36 W	0.02 %
		1.1 A	36 W	0.04 %
		2.999 99 A	99 W	0.04 %
		3 A	99 W	0.07 %
		10.9999 A	363 W	0.05 %
		11 A	363 W	0.11 %
		20.5 A	677 W	0.10 %
	329.9999 V	0.33 mA	0.1 W	0.03 %
		3.299 99 mA	1.1 W	0.01 %
		3.3 mA	1.1 W	0.02 %
		32.9999 mA	10.9 W	0.01 %
		33 mA	10.9 W	0.02 %
		329.999 mA	109 W	0.01 %
		0.33 A	109 W	0.03 %
		1.099 99 A	363 W	0.02 %
		1.1 A	363 W	0.04 %
		2.999 99 A	990 W	0.04 %
		3 A	990 W	0.07 %
		10.9999 A	3.6 kW	0.05 %
		11 A	3.6 kW	0.11 %
		20.5 A	6.8 kW	0.10 %
	330 V	0.33 mA	0.1 W	0.03 %
		3.299 99 mA	1.1 W	0.01 %
		3.3 mA	1.1 W	0.02 %
		32.9999 mA	10.9 W	0.01 %
		33 mA	10.9 W	0.02 %
		329.999 mA	109 W	0.01 %
		0.33 A	109 W	0.03 %
		1.099 99 A	363 W	0.02 %
		1.1 A	363 W	0.04 %
		2.999 99 A	990 W	0.04 %
		3 A	990 W	0.07 %
		10.9999 A	3.6 kW	0.05 %
		11 A	3.6 kW	0.11 %
		20.5 A	6.8 kW	0.10 %
Comments		Fluke 5520A		

	Voltage	Current (A)	Output Power (W)	(±) CMC[2, 6, 7, 8]
DC Power – Generate (cont)	1000 V	0.33 mA	0.3 W	0.03 %
		3.299 99 mA	3 W	0.01 %
		3.3 mA	3.3 W	0.02 %
		32.9999 mA	33 W	0.01 %
		33 mA	33 W	0.02 %
		329.999 mA	330 W	0.01 %
		0.33 A	330 W	0.03 %
		1.099 99 A	1.1 kW	0.02 %
		1.1 A	1.1 kW	0.04 %
		2.999 99 A	3 kW	0.04 %
		3 A	3 kW	0.07 %
		10.9999 A	11 kW	0.05 %
		11 A	11 kW	0.11 %
		20.5 A	20.5 kW	0.10 %
Comments		Fluke 5520A		

AC Power – Generate				
Frequency	Voltage	Current (A)	Output Power (W)	(±) CMC[2, 6, 7, 8]
(45 to 65) Hz PF = 1	33 mV	3.3 mA	109 µW	0.11 %
		32.999 mA	1.1 mW	0.06 %
		33 mA	1.1 mW	0.11 %
		329.99 mA	11 mW	0.06 %
		0.33 A	11 mW	0.09 %
		1.099 99 A	36 mW	0.07 %
		1.1 A	36 mW	0.08 %
		2.999 99 A	99 mW	0.07 %
		3 A	99 mW	0.13 %
		10.9999 A	363 mW	0.09 %
		11 A	363 mW	0.17 %
		20.5 A	677 mW	0.15 %
	329.999 mV	3.3 mA	1.1 mW	0.10 %
		32.999 mA	11 mW	0.05 %
		33 mA	11 mW	0.10 %
		329.99 mA	109 mW	0.05 %
		0.33 A	109 mW	0.08 %
		1.099 99 A	363 mW	0.06 %
		1.1 A	363 mW	0.07 %
		2.999 99 A	1 W	0.07 %
		3 A	1 W	0.13 %
		10.9999 A	3.6 W	0.08 %
		11 A	3.6 W	0.17 %
		20.5 A	6.8 W	0.15 %
Comments		Fluke 5520A		

AC Power – Generate				
Frequency	Voltage	Current (A)	Output Power (W)	(±) CMC[2, 6, 7, 8]
(45 to 65) Hz PF = 1	0.33 V	3.3 mA	1.1 mW	0.11 %
		32.999 mA	11 mW	0.06 %
		33 mA	11 mW	0.11 %
		329.99 mA	109 mW	0.06 %
		0.33 A	109 mW	0.09 %
		1.099 99 A	363 mW	0.07 %
		1.1 A	363 mW	0.08 %
		2.999 99 A	1 W	0.07 %
		3 A	1 W	0.13 %
		10.9999 A	3.6 W	0.08 %
		11 A	3.6 W	0.17 %
		20.5 A	6.8 W	0.15 %
	3.2999 V	3.3 mA	10.9 mW	0.10 %
		32.999 mA	109 mW	0.05 %
		33 mA	109 mW	0.10 %
		329.99 mA	1.1 W	0.05 %
		0.33 A	1.1 W	0.08 %
		1.099 99 A	3.6 W	0.06 %
		1.1 A	3.6 W	0.07 %
		2.999 99 A	9.9 W	0.07 %
		3 A	9.9 W	0.13 %
		10.9999 A	36 W	0.08 %
		11 A	36 W	0.17 %
		20.5 A	68 W	0.15 %
	3.3 V	3.3 mA	10.9 mW	0.11 %
		32.999 mA	109 mW	0.06 %
		33 mA	109 mW	0.11 %
		329.99 mA	1.1 W	0.06 %
		0.33 A	1.1 W	0.09 %
		1.099 99 A	3.6 W	0.07 %
		1.1 A	3.6 W	0.08 %
		2.999 99 A	9.9 W	0.07 %
		3 A	9.9 W	0.13 %
		10.9999 A	36 W	0.08 %
		11 A	36 W	0.17 %
		20.5 A	68 W	0.15 %
	32.9999 V	3.3 mA	109 mW	0.10 %
		32.999 mA	1.1 W	0.05 %
		33 mA	1.1 W	0.10 %
		329.99 mA	10.9 W	0.05 %
		0.33 A	10.9 W	0.08 %
		1.099 99 A	36.3 W	0.06 %
		1.1 A	36.3 W	0.07 %
		2.999 99 A	99 W	0.07 %
		3 A	99 W	0.13 %
		10.9999 A	363 W	0.08 %
		11 A	363 W	0.17 %
		20.5 A	676 W	0.15 %
Comments		Fluke 5520A		

AC Power – Generate				
Frequency	Voltage	Current (A)	Output Power (W)	(±) CMC[2, 6, 7, 8]
(45 to 65) Hz PF = 1	33 V	3.3 mA	109 mW	0.10 %
		32.999 mA	1.1 W	0.05 %
		33 mA	1.1 W	0.10 %
		329.99 mA	10.9 W	0.05 %
		0.33 A	10.9 W	0.08 %
		1.099 99 A	36 W	0.06 %
		1.1 A	36 W	0.07 %
		2.999 99 A	99 W	0.07 %
		3 A	99 W	0.13 %
		10.9999 A	363 W	0.08 %
		11 A	363 W	0.17 %
		20.5 A	677 W	0.15 %
	329.999 V	3.3 mA	1.1 W	0.10 %
		32.999 mA	10.9 W	0.05 %
		33 mA	10.9 W	0.10 %
		329.99 mA	109 W	0.05 %
		0.33 A	109 W	0.08 %
		1.099 99 A	363 W	0.06 %
		1.1 A	363 W	0.07 %
		2.999 99 A	990 W	0.07 %
		3 A	990 W	0.13 %
		10.9999 A	3.6 kW	0.08 %
		11 A	3.6 kW	0.17 %
		20.5 A	6.8 kW	0.15 %
	330 V	3.3 mA	1.1 W	0.11 %
		32.999 mA	10.9 W	0.06 %
		33 mA	10.9 W	0.11 %
		329.99 mA	109 W	0.06 %
		0.33 A	109 W	0.09 %
		1.099 99 A	363 W	0.07 %
		1.1 A	363 W	0.08 %
		2.999 99 A	990 W	0.07 %
		3 A	990 W	0.13 %
		10.9999 A	3.6 kW	0.08 %
		11 A	3.6 kW	0.17 %
		20.5 A	6.8 kW	0.15 %
	1000 V	3.3 mA	3.3 W	0.11 %
		32.999 mA	33 W	0.06 %
		33 mA	33 W	0.11 %
		329.99 mA	330 W	0.06 %
		0.33 A	330 W	0.09 %
		1.099 99 A	1.1 kW	0.07 %
		1.1 A	1.1 kW	0.08 %
		2.999 99 A	3 kW	0.07 %
		3 A	3 kW	0.13 %
		10.9999 A	11 kW	0.08 %
		11 A	11 kW	0.17 %
		20.5 A	20.5 kW	0.15 %
Comments		Fluke 5520A		

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
Capacitance – Generate[3]			
(0.19 to 0.4) nF	10 Hz to 10 kHz	0.5 % + 0.01 nF	Fluke 5520A
(0.4 to 1.1) nF	10 Hz to 10 kHz	0.5 % + 0.01 nF	
(1.1 to 3.3) nF	10 Hz to 3 kHz	0.5 % + 0.01 nF	
(3.3 to 11) nF	10 Hz to 1 kHz	0.25 % + 0.01 nF	
(11 to 33) nF	10 Hz to 1 kHz	0.25 % + 0.1 nF	
(33 to 110) nF	10 Hz to 1 kHz	0.25 % + 0.1 nF	
(110 to 330) nF	10 Hz to 1 kHz	0.25 % + 0.3 nF	
330 nF to 1.1 µF	(10 to 600) Hz	0.25 % + 1 nF	
(1.1 to 3.3) µF	(10 to 300) Hz	0.25 % + 3 nF	
(3.3 to 11) µF	(10 to 150) Hz	0.25 % + 10 nF	
(11 to 33) µF	(10 to 120) Hz	0.4 % + 30 nF	
(33 to 110) µF	(10 to 80) Hz	0.45 % + 100 nF	
(110 to 330) µF	(0 to 50) Hz	0.45 % + 300 nF	
330 µF to 1.1 mF	(0 to 20) Hz	0.45 % + 1 µF	
(1.1 to 3.3) mF	(0 to 6) Hz	0.45 % + 3 µF	
(3.3 to 11) mF	(0 to 2) Hz	0.45 % + 10 µF	
(11 to 33) mF	(0 to 0.6) Hz	0.75 % + 30 µF	
(33 to 110) mF	(0 to 0.2) Hz	1.1 % + 100 µF	
AC Voltage – Generate[3]			
Up to 2.2 mV	(10 to 20) Hz	0.022 % + 4 µV	Fluke 5700A/EP
	(20 to 40) Hz	85 µV/V + 4 µV	
	(0.04 to 20) kHz	75 µV/V + 4 µV	
	(20 to 50) kHz	0.018 % + 4 µV	
	(50 to 100) kHz	0.046 % + 5 µV	
	(100 to 300) kHz	0.09 % + 10 µV	
	(300 to 500) kHz	0.12 % + 20 µV	
	(0.5 to 1) MHz	0.25 % + 20 µV	
(2.2 to 22) mV	(10 to 20) Hz	0.022 % + 4 µV	
	(20 to 40) Hz	85 µV/V + 4 µV	
	(0.04 to 20) kHz	75 µV/V + 4 µV	
	(20 to 50) kHz	0.018 % + 4 µV	
	(50 to 100) kHz	0.046 % + 5 µV	
	(100 to 300) kHz	0.09 % + 10 µV	
	(300 to 500) kHz	0.12 % + 20 µV	
	(0.5 to 1) MHz	0.25 % + 20 µV	
(22 to 220) mV	(10 to 20) Hz	0.022 % + 12 µV	
	(20 to 40) Hz	85 µV/V + 7 µV	
	(0.04 to 20) kHz	75 µV/V + 7 µV	
	(20 to 50) kHz	0.018 % + 7 µV	
	(50 to 100) kHz	0.042 % + 17 µV	
	(100 to 300) kHz	0.075 % + 20 µV	

Parameter/Range	Frequency	CMC[2, 9] (±)	Comments
AC Voltage – Generate[3] (cont)			
(22 to 220) mV	(300 to 500) kHz (0.5 to 1) MHz	0.12 % + 25 µV 0.25 % + 45 µV	Fluke 5700A/EP
(0.22 to 2.2) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.022 % + 40 µV 80 µV/V + 15 µV 40 µV/V + 8 µV 70 µV/V + 10 µV 0.011 % + 30 µV 0.034 % + 80 µV 0.09 % + 200 µV 0.15 % + 300 µV	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.022 % + 400 µV 80 µV/V + 150 µV 40 µV/V + 50 µV 70 µV/V + 100 µV 95 µV/V + 200 µV 0.026 % + 600 µV 0.09 % + 2 mV 0.13 % + 3.2 mV	
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.022 % + 4 mV 80 µV/V + 1.5 mV 47 µV/V + 0.6 mV 75 µV/V + 1 mV 0.013 % + 2.5 mV 0.08 % + 16 mV 0.42 % + 40 mV 0.7 % + 80 mV	
(220 to 250) V	(15 to 40) Hz	0.026 % + 16 mV	
(220 to 1100) V	(40 to 50) Hz	80 µV/V + 4 mV	Fluke 5700A/EP with 5725A
	(0.05 to 1) kHz	60 µV/V + 3.5 mV	Fluke 5700A/EP
	(1 to 20) kHz (20 to 30) kHz	47 µV/V + 6 mV 0.036 % + 11 mV	Fluke 5700A/EP with 725A
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.036 % + 11 mV 0.13 % + 45 mV	

Parameter/Range	Frequency	CMC[2, 9] (±)	Comments
AC Voltage – Measure[3]			
(0.6 to 2.2) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz	0.17 % + 1.3 µV 0.074 % + 1.3 µV 0.042 % + 1.3 µV	Fluke 5790A
(0.6 to 2.2) mV	(20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.081 % + 2 µV 0.12 % + 2.5 µV 0.23 % + 4 µV 0.24 % + 8 µV 0.35 % + 8 µV	
(2.2 to 7) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	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 0.23 % + 8 µV	
(7 to 22) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.029 % + 1.3 µV 0.019 % + 1.3 µV 0.011 % + 1.3 µV 0.021 % + 2 µV 0.031 % + 2.5 µV 0.081 % + 4 µV 0.089 % + 8 µV 0.17 % + 8 µV	
(22 to 70) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	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 0.11 % + 8 µV	
(70 to 220) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.021 % + 1.5 µV 85 µV/V + 1.5 µV 38 µV/V + 1.5 µV 69 µV/V + 2 µV 0.016 % + 2.5 µV 0.025 % + 4 µV 0.038 % + 8 µV 0.1 % + 8 µV	

Parameter/Range	Frequency	CMC[2, 7, 9] (±)	Comments
AC Voltage – Measure[3] (cont)			
(220 to 700) mV	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.021 % + 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 0.018 % + 4 µV 0.03 % + 8 µV 0.096 % + 8 µV	Fluke 5790A
(0.7 to 2.2) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.02 % 66 µV/V 24 µV/V 46 µV/V 71 µV/V 0.016 % 0.026 % 0.09 %	
(2.2 to 7) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.02 % 67 µV/V 24 µV/V 48 µV/V 81 µV/V 0.019 % 0.04 % 0.12 %	
(7 to 22) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.02 % 67 µV/V 27 µV/V 48 µV/V 81 µV/V 0.019 % 0.04 % 0.12 %	
(22 to 70) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.02 % 68 µV/V 32 µV/V 57 µV/V 94 µV/V 0.02 % 0.041 % 0.12 %	

Parameter/Range	Frequency	CMC[2, 7, 9] (±)	Comments
AC Voltage – Measure[3] (cont)			
(70 to 220) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.02 % 68 µV/V 31 µV/V 69 µV/V 98 µV/V 0.021 % 0.05 %	Fluke 5790A
(220 to 700) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.02 % 99 µV/V 41 µV/V 0.013 % 0.05 %	
(700 to 1000) V	(10 to 20) Hz (20 to 40) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.02 % 99 µV/V 38 µV/V 0.013 % 0.05 %	
(1 to 10) kV	(30 to 200) Hz	0.12 % + 0.1 V	Vitrek 4700/HVP-35
(10 to 30) kV	(30 to 200) Hz	0.1 % + 0.2 V	

Parameter/Range	Frequency	CMC[2, 9] (±)	Comments
AC Current – Generate[3]			
(9 to 220) µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 % + 16 nA 0.014 % + 10 nA 0.011 % + 8 nA 0.025 % + 0.12 nA 0.09 % + 65 nA	Fluke 5700A/EP
(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	0.023 % + 40 nA 0.014 % + 35 nA 0.011 % + 35 nA 0.018 % + 110 nA 0.09 % + 650 nA	
(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	0.023 % + 400 nA 0.014 % + 350 nA 0.011 % + 350 nA 0.018 % + 550 nA 0.09 % + 5 µA	
(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	0.023 % + 4 µA 0.014 % + 3.5 µA 0.011 % + 2.5 µA 0.018 % + 3.5 µA 0.09 % + 10 µA	
(0.22 to 2.2) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 35 µA 0.039 % + 80 µA 0.6 % + 160 µA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.04 % + 170 µA 0.085 % + 380 µA 0.33 % + 750 µA	Fluke 5700A/EP with 5725A

Parameter/Range	Frequency	CMC[2, 6, 7, 9] (±)	Comments
AC Current – Generate[3] (cont)			
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3 % + 5 mA	Fluke 5520A
(20 to 1000) A	(45 to 65) Hz	0.3 %	Fluke 5520A with 5500A coil
Clamp Meters	(65 to 440) Hz	0.81 %	
AC Current – Measure[3]			
(2 to 200) µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A	10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 2 kHz (2 to 10) kHz	0.05 % + 0.02 µA 0.03 % + 0.2 µA 0.03 % + 2 µA 0.05 % + 20 µA 0.062 % + 200 µA 0.073 % + 200 µA	Fluke 8508A
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.082 % + 2 mA 0.25 % + 2 mA	
Oscilloscope – Leveled Sine Wave[3]			
Absolute 5 mV to 5.5 V	50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2 % + 300 µV 3.5 % + 300 µV 4 % + 300 µV 6 % + 300 µV 7 % + 300 µV	Fluke 5520A with SC1100 option. CMC's do not include loading effect of UUT

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Oscilloscope – Leveled Sine Wave[3] (cont)			
Flatness			
(Relative to 50 kHz) 5 mV to 5.5 V	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.5 % + 100 µV 2 % + 100 µV 4 % + 100 µV 5 % + 100 µV	Fluke 5520A w/SC1100 option. CMC's do not include loading effect of UUT
Amplitude			
DC Signal			
50 Ω load	(-6.6 to 6.6) V	0.25 % + 40 µV	
1 MΩ load	(-130 to 130) V	0.05 % + 40 µV	
Time Marker, 50 Ω Load	5 s to 50 ms 20 ms to 1 ns	(25 + 1000*t*) µs/s 2.5 µs/s	*t* is the time in seconds
Edge – Rise Time			
50 Ω load	≤ 300 ps	+0 ps/-100 ps	Markers in a 5-2-1 sequence
≤ 2 MHz > 2 MHz	≤ 300 ps > 350 ps	+0 ps/-100 ps +0 ps/-100 ps	

III. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 7, 10] (±)	Comments
Gas Flow[3] – Measuring Equipment	(Up to 100) slm	0.2 %	DHI molbox1/molblocs

IV. Mechanical

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Torque –			
Wrenches, Screwdrivers, Watches[3]	(5 to 50) ozf·in (15 to 200) ozf·in (4 to 1000) lbf·in (20 to 2000) lbf·ft	0.5 % 0.25 % 0.25 % 0.25 %	Torque transducers & display
Analyzers, Transducers	Up to 200 ozf·in Up to 1000 lbf·in Up to 2000 lbf·ft	0.05 % 0.05 % 0.05 %	Torque arms with NIST Class F weights
Pressure[3] –			
Gauge Pressure			
Gas	(0 to 9) psig (0.2 to 1) psig (1 to 25) psig (25 to 100) psig	7.2×10^{-4} psig 2.2×10^{-5} psig 0.0013 % + 8.6×10^{-6} psig 0.0013 % + 1.9×10^{-5} psig	Fluke PPC4/RPM4 Ruska 2465
	(0.72 to 50) psig (5.8 to 1000) psig	0.0012 % + 1×10^{-5} psig 0.0018 % + 1.7×10^{-4} psig	DHI PG7601
	(50 to 1000) psig (1000 to 10 000) psig	0.0022 % + 1.6×10^{-5} psig 0.0034 % + 2.8×10^{-4} psig	DH 5201 DH 5203
Oil	(20 to 6000) psig (6000 to 30 000) psig (30 000 to 50 000) psig	0.0020 % + 2.4×10^{-3} psig 0.0035 % + 5.1×10^{-3} psig 0.0046 % + 1.1×10^{-2} psig	Fluke PG7302
Absolute Pressure			
Gas	(0 to 9) psia (0.2 to 1) psia (1 to 25) psia (25 to 100) psia (100 to 1000) psia	7.2×10^{-4} psia 2.5×10^{-5} psia 0.0013 % + 1.2×10^{-5} psia 0.0013 % + 2.1×10^{-5} psia 0.0028 % + 1.7×10^{-4} psia	Fluke PPC4/RPM4 Ruska 2465
	(0.72 to 50) psia (14.5 to 1000) psia	0.0012 % + 1.1×10^{-5} psia 0.0018 % + 1.7×10^{-4} psia	DHI PG7601

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Pressure[3] – (cont)			
Absolute Pressure			
Oil	(1000 to 10 000) psia (20 to 6000) psia (6000 to 30 000) psia (30 000 to 50 000) psia	0.0034 % + 1.5 x 10^{-3} psia 0.0020 % + 2.8 x 10^{-3} psia 0.0035 % + 5.3 x 10^{-3} psia 0.0046 % + 1.1 x 10^{-2} psia	DH 5203 Fluke PG7302
Differential Pressure			
Gas	(0.018 to 5) psig	0.0013 % + 1.2 x 10^{-5} psig	Ruska 2465
Mass – Standards/Artifacts	1 mg to 0.1 g (0.1 to 5) g (5 to 20) g (20 to 50) g (>50 to 100) g (200 to 300) g (>300 to 500) g >500 g to 1 kg (>1 to 2) kg (2 to 3) kg (>3 to 4) kg (>4 to 5) kg (>5 to 10) kg (>10 to 20) kg (>20 to 25) kg	0.04 mg 0.04 mg 0.05 mg 0.11 mg 0.36 mg 0.5 mg 3.3 mg 3.7 mg 5.6 mg 7.2 mg 9 mg 11 mg 28 mg 49 mg 59 mg	Mettler AT250, PM1200 & Sartorius MSE5203S, direct comparison to ASTM Class 2 masses Radwag PM 25.4Y.KB, direct comparison to ASTM Class 2 or 3 masses
Balances[3]	(0 to 200) g 200 g to 1 kg (1 to 5) kg (5 to 25) kg (0 to 10) lb (0 to 4535.924) g (10 to 20) lb (4.535 924 to 9.071 847) kg (20 to 50) lb (9.071 847 to 22.679 618) kg	0.46 mg 3.0 mg 10 mg 59 mg 22 mg 29 mg 54 mg	Comparison to Class 2, 3 or F masses
Force Gages[3]	Up to 600 lbf	0.02 %	ASTM Class F weights

V. Thermodynamics

Parameter/Equipment	Range	CMC[2, 7, 10] (±)	Comments
Infrared Pyrometry[3] –			
Infrared Thermometers & Calibrators	(-30 to 140) °C	0.2 % + 1 °C	Isotech Venus 2140
	(35 to 100) °C (100 to 200) °C (200 to 350) °C (350 to 500) °C	0.55 °C 0.79 °C 1.4 °C 1.8 °C	Hart 4181
	(150 to 1200) °C (600 to 2300) °C	0.2 % + 2 °C 0.25 % + 2 °C	Isotech Pegasus R Mikron M390
	(-50 to 1200) °C (600 to 1500) °C (1500 to 2300) °C	0.16 % + 0.3 °C 0.16 % + 0.3 °C 0.25 %	Heitronics TRT IV.82 IMPAC IS 12-TSP
Optical Pyrometry	(800 to 1100) °C (1100 to 1500) °C (1500 to 1900) °C (1900 to 2300) °C	1.8 °C 1.9 °C 2 °C 3 °C	Tungsten ribbon filament lamp, current shunt, DMM
Humidity[3] –			
Measuring Equipment	(10 to 95) % RH	0.5 % RH	Thunder 1200
Measure[3]	(10 to 80) % RH	1.1 % RH	Vaisala HMI41/HMP46
Temperature – Measuring Equipment & Measure[3]	(-30 to 140) °C (140 to 420) °C (420 to 660) °C	0.14 °C 0.4 °C 0.6 °C	Dry block calibrator

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Temperature – Measuring Equipment & Measure – (cont)	(-80 to 0) °C (0 to 300) °C	0.009 °C 0.006 °C	Comparison to SPRT in liquid bath
	(300 to 500) °C	0.011 °C	Salt bath
	-196 °C	0.004 °C	Liquid nitrogen comparison
	(0 to 1250) °C	0.8 °C	Comparison to noble metal thermocouple

VI. Time & Frequency

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Frequency – Counters, Generators			
Fixed Points	(5 & 10) MHz	2 parts in 10^{12} Hz	Fluke 910
Measuring Equipment	0.01 Hz to 20 MHz	3 parts in 10^{11} Hz	HP 3325B locked w Fluke 910
Measure	0.01 Hz to 225 MHz	3 parts in 10^{11} Hz	Fluke PM6680 locked w Fluke 910
Timers	6 ns to 1 x 10^{6} s	5.8 parts in 10^{7} s	Fluke PM6680B locked w/ Fluke 910

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Frequency – Counters, Generators (cont)			
Measure[3]	(0.01 to 225) MHz	1 part in 10^7 Hz	Fluke PM6680B
Measuring Equipment[3]	50 kHz to 1100 MHz	2.5 parts in 10^6 Hz	Fluke 5500A/SC1100
Time Intervals, Timers[3]	6 ns to 1 x 10^6 s	6 parts in 10^7 s	

[1] This laboratory offers commercial 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] Based on using the standard at the temperature the HP 3458A was calibrated (tcal ± 5 °C) and an auto-calibration (ACAL) was performed within the previous 24 hours (± 1 °C of ambient temperature). CMC is based upon 1-year specifications and is read as parts in 10^6 or percent output plus floor specification or as parts in 10^6 or percent of reading plus parts in 10^6 or percent of range.

[5] In the statement of CMC, *L* is the numerical value of the nominal length of the device measured in inches. In the statement of CMC, *D* is the numerical value of the nominal diameter of the device measured in inches. In the statement of CMC, *DL* is the diagonal length of the surface plate measured in inches.

[6] Based on using the standard at the temperature the Fluke 5520A was calibrated (tcal ± 5 °C) and assuming the instrument is zeroed at least every seven days or when the ambient temperature changes more than 5 °C. For resistance, a zero calibration is performed at least every 12 hours within ± 1 °C of use. For AC Current, CMCs are determined with LCOMP Off. CMC is based upon 1-year specifications and is read as ppm or percent output plus floor specification. When "ppm" is used on the scope, it refers to parts in 10^6.

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

[8] The CMC values shown are for the voltage and current values applied at that wattage level. They are not to be considered fixed points and may vary. The actual measurement uncertainty will be calculated using

the voltage and current level applied with consideration of the device under test.

[9] 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.

[10] 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.

[11] This scope meets A2LA's *P112 Flexible Scope Policy*.

Accredited Laboratory

A2LA has accredited

PROCESS INSTRUMENTS INC.

Pittsburgh, PA

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/NCSL 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 14th day of April 2022.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1894.01
Valid to April 30, 2024

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