



# ANSI National Accreditation Board

## SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017 AND ANSI/NCSL Z540-1-1994 (R2002)

### Continental Testing

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### CALIBRATION

Valid to: **June 29, 2020**

Certificate Number: **AC-1647**

#### Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Source	Up to 330 $\mu$ A 330 $\mu$ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3.0) A (3.0 to 11) A (11 A to 20.5) A	100 $\mu$ A/A + 29 nA 67 $\mu$ A/A + 60 nA 67 $\mu$ A/A + 490 nA 67 $\mu$ A/A + 4.8 $\mu$ A 140 $\mu$ A/A + 48 $\mu$ A 250 $\mu$ A/A + 86 $\mu$ A 330 $\mu$ A/A + 98 $\mu$ A 670 $\mu$ A/A + 2.5 mA	Fluke 5520A Multiproduct Calibrator
DC Current – Source	(20 to 30) A (30 to 110) A (110 to 205) A	1.6 mA/A + 2.1 mA 1.7 mA/A + 21 mA 2 mA/A + 26 mA	Fluke 5520A Multiproduct Calibrator w/ 10 Turn Coil
DC Current – Source	(205 to 550) A (550 to 1 025) A	1.7 mA/A + 110 mA 2 mA/A + 130 mA	Fluke 5520A Multiproduct Calibrator w/ 50 Turn Coil
DC Voltage - Source	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1.0) kV	13 $\mu$ V/V + 2.3 $\mu$ V 7.3 $\mu$ V/V + 20 $\mu$ V 8 $\mu$ V/V + 200 $\mu$ V 12 $\mu$ V/V + 2 mV 12 $\mu$ V/V + 3.5 mV	Fluke 5520A Multiproduct Calibrator
DC Resistance - Source	Up to 11 $\Omega$ (11 to 33) $\Omega$ (33 to 110) $\Omega$ (110 to 330) $\Omega$ 330 $\Omega$ to 1.1 k $\Omega$ (1.1 to 3.3) k $\Omega$ (3.3 to 11) k $\Omega$	27 $\mu\Omega/\Omega$ + 1.1 m $\Omega$ 20 $\mu\Omega/\Omega$ + 1.6 m $\Omega$ 19 $\mu\Omega/\Omega$ + 1.6 m $\Omega$ 19 $\mu\Omega/\Omega$ + 3.3 m $\Omega$ 19 $\mu\Omega/\Omega$ + 4.4 m $\Omega$ 19 $\mu\Omega/\Omega$ + 32 m $\Omega$ 19 $\mu\Omega/\Omega$ + 34 m $\Omega$	Fluke 5520A Multiproduct Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Resistance - Source	(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	19 μΩ/Ω + 390 mΩ 19 μΩ/Ω + 720 mΩ 22 μΩ/Ω + 4.0 Ω 22 μΩ/Ω + 12 Ω 40 μΩ/Ω + 120 Ω 87 μΩ/Ω + 230 Ω 170 μΩ/Ω + 3.1 kΩ 340 μΩ/Ω + 12 kΩ 2 mΩ/Ω + 200 kΩ 10 mΩ/Ω + 4.2 MΩ	Fluke 5520A Multiproduct Calibrator
Conductance - Source	910 ps to 3.0 ns (3.0 to 9.1) ns (9.1 to 30) ns (30 to 91) ns (91 to 300) ns (300 to 910) ns 910 ns to 3.0 μs (3.0 to 9.1) μs (9.1 to 30) μs (30 to 91) μs (91 to 300) μs (300 to 910) μs 910 μs to 3.0 ms (3.0 to 9.1) ms (9.1 to 30) ms (30 to 91) ms (91 to 300) ms (300 to 910) ms 910 ms to 3.0 s (3.0 to 9.1) s	27 μs/s + 12 ps 2.8 ms/s + 12 ps 410 μs/s + 40 ps 410 μs/s + 4.0 ps 100 μs/s + 25 ps 64 μs/s + 25 ps 25 μs/s + 190 ps 37 μs/s + 200 ps 24 μs/s + 1.9 ns 34 μs/s + 1.9 ns 24 μs/s + 19 ns 34 μs/s + 19 ns 24 μs/s + 190 ns 34 μs/s + 200 ns 54 μs/s + 1.9 ns 140 μs/s + 19 μs 280 μs/s + 190 μs 800 μs/s + 1.9 ms 2.5 ms/s + 19 ms 7.8 ms/s + 190 ms	Fluke 5520A Multiproduct Calibrator
AC Current – Source	(29 to 330) μA (10 Hz to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.3 mA/A + 1.9 uA 1 mA/A + 1.9 uA 840 μA/A + 1.9 μA 2 mA/A + 1.9 μA 5.3 mA/A + 1.9 μA 11 mA/A + 1.9 μA	Fluke 5520A Multiproduct Calibrator

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source	330 $\mu$ A to 3.3 mA		Fluke 5520A Multiproduct Calibrator
	(10 Hz to 20) Hz	1.3 mA/A + 2.0 $\mu$ A	
	(20 to 45) Hz	840 $\mu$ A/A + 1.9 $\mu$ A	
	45 Hz to 1 kHz	970 $\mu$ A/A + 1.9 $\mu$ A	
	(1 to 5) kHz	1.3 mA/A + 2 $\mu$ A	
	(5 to 10) kHz	3.3 mA/A + 2 $\mu$ A	
	(10 to 30) kHz	6.7 mA/A + 2.1 $\mu$ A	
	(3.3 to 33) mA		
	(10 to 20) Hz	1.2 mA/A + 6.9 $\mu$ A	
	(20 to 45) Hz	600 $\mu$ A/A + 6.9 $\mu$ A	
	45 Hz to 1 kHz	270 $\mu$ A/A + 6.9 $\mu$ A	
	(1 to 5) kHz	540 $\mu$ A/A + 4.4 $\mu$ A	
	(5 to 10) kHz	1.3 mA/A + 9 $\mu$ A	
	(10 to 30) kHz	2.7 mA/A + 9.3 $\mu$ A	
	(33 to 330) mA		
	(10 to 20) Hz	1.2 mA/A + 89 $\mu$ A	
	(20 to 45) Hz	600 $\mu$ A/A + 38 $\mu$ A	
	45 Hz to 1 kHz	270 $\mu$ A/A + 38 $\mu$ A	
	(1 to 5) kHz	670 $\mu$ A/A + 57 $\mu$ A	
	(5 to 10) kHz	1.3 mA/A + 110 $\mu$ A	
	(10 to 30) kHz	2.7 mA/A + 210 $\mu$ A	
	330 mA to 1.1 A		
	(10 to 45) Hz	1.2 mA/A + 260 $\mu$ A	
	45 Hz to 1 kHz	340 $\mu$ A/A + 160 $\mu$ A	
	(1 to 5) kHz	4 mA/A + 1.1 mA	
	(5 to 10) kHz	17 mA/A + 5.1 mA	
	(1.1 to 3.0) A		
	(10 to 45) Hz	1.2 mA/A + 730 $\mu$ A	
45 Hz to 1 kHz	400 $\mu$ A/A + 400 $\mu$ A		
(1 to 5) kHz	4 mA/A + 1.2 mA		
(5 to 10) kHz	17 mA/A + 5.1 mA		
(3.0 to 11) A			
(45 Hz to 100) Hz	400 $\mu$ A/A + 2.5 mA		
100 Hz to 1 kHz	670 $\mu$ A/A + 2.7 mA		
(1 to 5) kHz	20 mA/A + 4.5 mA		
(11 to 20.5) A			
(45 to 100) Hz	800 $\mu$ A/A + 6.6 mA		
100 Hz to 1 kHz	1 mA/A + 6.6 mA		
(1 to 5) kHz	20 mA/A + 12 mA		

**Electrical – DC/Low Frequency**

<b>Parameter/Equipment</b>	<b>Range</b>	<b>Expanded Uncertainty of Measurement (+/-)</b>	<b>Reference Standard, Method, and/or Equipment</b>
AC Current – Source	(20 to 30) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	2.5 mA/A + 7.5 mA 1.7 mA/A + 4.4 mA 5.3 mA/A + 12 mA 18 mA/A + 51 mA	Fluke 5520A Multiproduct Calibrator w/ 10 Turn Coil
	(30 to 110) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.7 mA/A + 31 mA 2 mA/A + 32 mA 22 mA/A + 49 mA	
AC Current – Source	(110 to 205) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	2.1 mA/A + 66 mA 2.3 mA/A + 66 mA 22 mA/A + 120 mA	Fluke 5520A Multiproduct Calibrator w/ 10 Turn Coil
AC Current – Source	(205 to 550) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.7 mA/A + 160 mA 2 mA/A + 160 mA 22 mA/A + 250 mA	Fluke 5520A Multiproduct Calibrator w/ 50 Turn Coil
	(550 to 1 025) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	2.1 mA/A + 330 mA 2.3 mA/A + 330 mA 22 mA/A + 560 mA	
AC Voltage - Source	(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	540 $\mu$ V/V + 7 $\mu$ V 100 $\mu$ V/V + 6.5 $\mu$ V 140 $\mu$ V/V + 6.5 $\mu$ V 670 $\mu$ V/V + 7.8 $\mu$ V 2.3 mV/V + 15 $\mu$ V 5.3 mV/V + 56 $\mu$ V	Fluke 5520A Multiproduct Calibrator
	(33to 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	200 $\mu$ V/V + 21 $\mu$ V 67 $\mu$ V/V + 13 $\mu$ V 110 $\mu$ V/V + 14 $\mu$ V 240 $\mu$ V/V + 20 $\mu$ V 540 $\mu$ V/V + 42 $\mu$ V 1.3 mV/V + 120 $\mu$ V	

**Electrical – DC/Low Frequency**

<b>Parameter/Equipment</b>	<b>Range</b>	<b>Expanded Uncertainty of Measurement (+/-)</b>	<b>Reference Standard, Method, and/or Equipment</b>
AC Voltage - Source	330 mV to 3.3 V (10 to 45) Hz	200 $\mu\text{V}/\text{V}$ + 200 $\mu\text{V}$	Fluke 5520A Multiproduct Calibrator
	45 Hz to 10 kHz (10 to 20) kHz	100 $\mu\text{V}/\text{V}$ + 110 $\mu\text{V}$	
	(20 to 50) kHz	130 $\mu\text{V}/\text{V}$ + 96 $\mu\text{V}$	
	(50 to 100) kHz	200 $\mu\text{V}/\text{V}$ + 140 $\mu\text{V}$	
	(100 to 500) kHz	470 $\mu\text{V}/\text{V}$ + 240 $\mu\text{V}$	
	1.6 mV/V + 1.2 mV		
	(3.3 to 33) V (10 to 45) Hz	200 $\mu\text{V}/\text{V}$ + 2.1 mV	
	45 Hz to 10 kHz (10 to 20) kHz	100 $\mu\text{V}/\text{V}$ + 1.2 mV	
	(20 to 50) kHz	160 $\mu\text{V}/\text{V}$ + 1.1 mV	
	(50 to 100) kHz	240 $\mu\text{V}/\text{V}$ + 1.6 mV	
	600 $\mu\text{V}/\text{V}$ + 2.8 mV		
	(33 to 330) V 45 Hz to 1 kHz	130 $\mu\text{V}/\text{V}$ + 12 mV	
	(1 to 10) kHz	140 $\mu\text{V}/\text{V}$ + 13 mV	
	(10 to 20) kHz	170 $\mu\text{V}/\text{V}$ + 13 mV	
	(20 to 50) kHz	200 $\mu\text{V}/\text{V}$ + 20 mV	
	(50 to 100) kHz	1.3 mV/V + 94 mV	
Capacitance - Simulation	(330 to 1 020) V 45 to 1 kHz	200 $\mu\text{V}/\text{V}$ + 38 mV	Fluke 5520A Multiproduct Calibrator
	(1 to 5) kHz	160 $\mu\text{V}/\text{V}$ + 42 mV	
	(5 to 10) kHz	200 $\mu\text{V}/\text{V}$ + 42 mV	
	(0.19 to 0.4) nF	3.3 mF/F + 11 pF	
	(0.4 to 1.1) nF	3.3 mF/F + 11 pF	
	(1.1 to 3.3) nF	3.3 mF/F + 11 pF	
	(3.3 to 11) nF	1.7 mF/F + 13 pF	
	(11 to 33) nF	1.7 mF/F + 100 pF	
	(33 to 110) nF	1.7 mF/F + 130 pF	
	(110 to 330) nF	1.7 mF/F + 370 pF	
	330 nF to 1.1 $\mu\text{F}$	1.7 mF/F + 1.3 nF	
	(1.1 to 3.3) $\mu\text{F}$	1.7 mF/F + 3.7 nF	
	(3.3 to 11) $\mu\text{F}$	1.7 mF/F + 13 nF	
	(11 to 33) $\mu\text{F}$	2.7 mF/F + 37 nF	
	(33 to 110) $\mu\text{F}$	3 mF/F + 130 nF	
	(110 to 330) $\mu\text{F}$	3 mF/F + 310 nF	
330 $\mu\text{F}$ to 1.1 mF	3 mF/F + 1.1 $\mu\text{F}$		
(1.1 to 3.3) mF	3 mF/F + 3.1 $\mu\text{F}$		
(3.3 to 11) mF	3 mF/F + 11 $\mu\text{F}$		
(11 to 33) mF	5 mF/F + 31 $\mu\text{F}$		
(33 to 110) mF	7.3 mF/F + 220 $\mu\text{F}$		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes AC Voltage, Square Wave (50 Ω)	(10 Hz to 10kHz) (1 to 25) mV (25 to 110) mV (110 to 500) mV 500 mV to 2.2 V (2.2 to 6.6) V	4 mV/V + 62 μV 4 mV/V + 190 μV 4 mV/V + 920 μV 4 mV/V + 4.6 mV 4 mV/V + 9.2 mV	Fluke 5520A-SC1100 Multiproduct Calibrator
Oscilloscopes AC Voltage, Square Wave (1 MΩ)	(10 Hz to 1 kHz) (1 to 500) mV 500 mV to 2.2 V (2.2 to 11) V (11 to 130) V (1 to 10) kHz (1 to 500) mV 500 mV to 2.2 V (2.2 to 11) V (11 to 130) V	3.7 mV/V + 920 μV 3.7 mV/V + 5.6 mV 3.7 mV/V + 19 mV 3.7 mV/V + 190 mV 4 mV/V + 920 μV 4 mV/V + 4.6 mV 4 mV/V + 19 mV 4 mV/V + 190 mV	Fluke 5520A-SC1100 Multiproduct Calibrator
Oscilloscopes DC Voltage (50 Ω)	(0 to 110) mV (110 to 499) mV 499 mV to 2.2 V (2.2 to 6.6) V	4 mV/V + 190 μV 4 mV/V + 920 μV 4 mV/V + 4.6 mV 4 mV/V + 9.2 mV	Fluke 5520A-SC1100 Multiproduct Calibrator
(1 MΩ)	(0 to 500) mV 500 mV to 2.2 V (2.2 to 11) V (11 to 70.5) V (70.5 to 130) V	3.6 mV/V + 920 μV 3.6 mV/V + 4.6 mV 3.6 mV/V + 19 mV 3.6 mV/V + 92 mV 3.6 mV/V + 190 mV	
Leveled Sine Wave (Absolute) (50 Ω, 50kHz)	(5 to 10) mVpp (10 to 40) mVpp (40 to 100) mVpp (100 to 800) mVpp 800 mVpp to 1.3 Vpp (1.3 to 5.5) Vpp	14 mV/V + 300 μV 14 mV/V + 310 μV 14 mV/V + 360 μV 14 mV/V + 1.2 mV 14 mV/V + 2 mV 14 mV/V + 9.6 mV	
Leveled Sine Wave (Absolute) (50 Ω) 50 kHz to 10 MHz (10 to 100) MHz (100 to 300) MHz (300 to 600) MHz (600 to 1 100) MHz	5 mVpp to 5.5 Vpp 5 mVpp to 5.5 Vpp 5 mVpp to 5.5 Vpp 5 mVpp to 5.5 Vpp 5 mVpp to 3.5 Vpp	24 mV/V + 9.2 mV 25 mV/V + 9.2 mV 28 mV/V + 9.2 mV 41 mV/V + 9.2 mV 48 mV/V + 9.2 mV	Fluke 5520A-SC1100 Multiproduct Calibrator





Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Leveled Sine Wave (Relative to 50 kHz) (50 Ω) 50 kHz to 10 MHz (10 to 100) MHz (100 to 300) MHz (300 to 600) MHz (600 to 1 100) MHz Oscilloscope Input Resistance Measurement (50 Ω Input) (1 MΩ Input)	5 mVpp to 5.5 Vpp 5 mVpp to 5.5 Vpp 5 mVpp to 5.5 Vpp 5 mVpp to 5.5 Vpp 5 mVpp to 3.5 Vpp  (40 to 60) Ω 500 kΩ to 1.5 MΩ	11 mV/V + 9.2 mV 13 mV/V + 9.2 mV 16 mV/V + 9.2 mV 28 mV/V + 9.2 mV 35 mV/V + 9.2 mV  670 μΩ/Ω + 15 mΩ 670 μΩ/Ω + 180 Ω	Fluke 5520A-SC1100 Multiproduct Calibrator
Oscilloscope Input Capacitance Measurement (1 MΩ Input)	(5 to 50) pF	34 mF/F + 780 fF	Fluke 5520A-SC1100 Multiproduct Calibrator
DC Current - Measure	Up 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	30 μA/A + 41 pA 20 μA/A + 54 pA 20 μA/A + 240 pA 20 μA/A + 2 nA 20 μA/A + 17 nA 20 μA/A + 170 nA 35 μA/A + 2.4 μA 110 μA/A + 50 μA	Agilent / HP 3458A Multimeter
AC Current - Measure	Up to 100 μA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 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	4 mA/A + 44 nA 1.5 mA/A + 240 nA 600 μA/A + 40 nA 600 μA/A + 40 nA  4 mA/A + 240 nA 1.5 mA/A + 240 nA 600 μA/A + 240 nA 300 μA/A + 240 nA 400 μA/A + 240 nA 2.7 mA/A + 420 nA 3.7 mA/A + 1.5 μA	Agilent / HP 3458A Multimeter



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current - Measure	(1 to 10) mA		Agilent / HP 3458A Multimeter
	(10 to 20) Hz	4 mA/A + 2.7 $\mu$ A	
	(20 to 45) Hz	1.5 mA/A + 2.7 $\mu$ A	
	(45 to 100) Hz	600 $\mu$ A/A + 2.7 $\mu$ A	
	100 Hz to 5 kHz	300 $\mu$ A/A + 2.7 $\mu$ A	
	(5 to 20) kHz	600 $\mu$ A/A + 2.7 $\mu$ A	
	(20 to 50) kHz	4 mA/A + 4.5 $\mu$ A	
	(50 to 100) kHz	5.5 mA/A + 16 $\mu$ A	
	(10 to 100) mA		
	(10 to 20) Hz	4 mA/A + 28 $\mu$ A	
	(20 to 45) Hz	1.5 mA/A + 28 $\mu$ A	
	(45 to 100) Hz	600 $\mu$ A/A + 28 $\mu$ A	
	100 Hz to 5 kHz	300 $\mu$ A/A + 28 $\mu$ A	
	(5 to 20) kHz	600 $\mu$ A/A + 28 $\mu$ A	
	(20 to 50) kHz	4 mA/A + 45 $\mu$ A	
(50 to 100) kHz	5.5 mA/A + 160 $\mu$ A		
DC Voltage - Measure	100 mA to 1 A		Agilent / HP 3458A Multimeter
	(10 to 20) Hz	4 mA/A + 290 $\mu$ A	
	(20 to 45) Hz	1.6 mA/A + 290 $\mu$ A	
	(45 to 100) Hz	800 $\mu$ A/A + 290 $\mu$ A	
	100 Hz to 5 kHz	1 mA/A + 290 $\mu$ A	
	(5 to 20) kHz	3 mA/A + 290 $\mu$ A	
(20 to 50) kHz	10 mA/A + 460 $\mu$ A		
AC Voltage - Measure	Up to 100 mV	9 $\mu$ V/V + 510 nV	Agilent / HP 3458A Multimeter
	100 mV to 1 V	8 $\mu$ V/V + 3 $\mu$ V	
	(1 to 10) V	8 $\mu$ V/V + 28 $\mu$ V	
	(10 to 100) V	10 $\mu$ V/V + 510 $\mu$ V	
	(100 to 1 000) V	10 $\mu$ V/V + 7.3 mV	
AC Voltage - Measure	Up to 10 mV		Agilent / HP 3458A Multimeter
	(1 to 40) Hz	300 $\mu$ V/V + 4.1 $\mu$ V	
	40 Hz to 1 kHz	200 $\mu$ V/V + 3 $\mu$ V	
	(1 to 20) kHz	300 $\mu$ V/V + 3.1 $\mu$ V	
	(20 to 50) kHz	1 mV/V + 9.1 $\mu$ V	
	(50 to 100) kHz	5 mV/V + 66 $\mu$ V	
(100 to 300) kHz	40 mV/V + 66 $\mu$ V		





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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Measure	(10 to 100) mV		Agilent / HP 3458A Multimeter
	(1 to 40) Hz	70 $\mu$ V/V + 7 $\mu$ V	
	40 Hz to 1 kHz	70 $\mu$ V/V + 6.1 $\mu$ V	
	(1 to 20) kHz	140 $\mu$ V/V + 8.1 $\mu$ V	
	(20 to 50) kHz	300 $\mu$ V/V + 38 $\mu$ V	
	(50 to 100) kHz	800 $\mu$ V/V + 38 $\mu$ V	
	(100 to 300) kHz	300 $\mu$ V/V + 70 $\mu$ V	
	300 kHz to 1 MHz	10 mV/V + 70 $\mu$ V	
	(1 to 2) MHz	15 mV/V + 70 $\mu$ V	
	100 mV to 1 V		
	(1 to 40) Hz	70 $\mu$ V/V + 64 $\mu$ V	
	40 Hz to 1 kHz	70 $\mu$ V/V + 54 $\mu$ V	
	(1 to 20) kHz	140 $\mu$ V/V + 72 $\mu$ V	
	(20 to 50) kHz	300 $\mu$ V/V + 0.14 mV	
	(50 to 100) kHz	800 $\mu$ V/V + 0.22 mV	
	(100 to 300) kHz	300 $\mu$ V/V + 0.61 mV	
	300 kHz to 1 MHz	10 mV/V + 1.7 mV	
	(1 to 2) MHz	15 mV/V + 1.7 mV	
	(1 to 10) V		
	(1 to 40) Hz	70 $\mu$ V/V + 700 $\mu$ V	
	40 Hz to 1 kHz	70 $\mu$ V/V + 530 $\mu$ V	
	(1 to 20) kHz	140 $\mu$ V/V + 710 $\mu$ V	
	(20 to 50) kHz	300 $\mu$ V/V + 1.4 mV	
	(50 to 100) kHz	800 $\mu$ V/V + 1.7 mV	
	(100 to 300) kHz	300 $\mu$ V/V + 5.2 mV	
	300 kHz to 1 MHz	10 mV/V + 19 mV	
	(1 to 2) MHz	15 mV/V + 19 mV	
	(10 to 100) V		
	(1 to 40) Hz	200 $\mu$ V/V + 9.3 mV	
	40 Hz to 1 kHz	200 $\mu$ V/V + 8.7 mV	
(1 to 20) kHz	200 $\mu$ V/V + 13 mV		
(20 to 50) kHz	350 $\mu$ V/V + 15 mV		
(50 to 100) kHz	1.2 mV/V + 35 mV		
(100 to 300) kHz	4 mV/V + 36 mV		
300 kHz to 1 MHz	15 mV/V + 36 mV		
750 V			
(1 to 40) Hz	400 $\mu$ V/V + 83 mV		
40 Hz to 1 kHz	400 $\mu$ V/V + 79 mV		
(1 to 20) kHz	600 $\mu$ V/V + 79 mV		
(20 to 50) kHz	1.2 mV/V + 79 mV		
(50 to 100) kHz	3 mV/V + 79 mV		





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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Measure	Up to 100 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	15 μΩ/Ω + 0.11 mΩ 12 μΩ/Ω + 1 mΩ 10 μΩ/Ω + 7.6 mΩ 10 μΩ/Ω + 76 mΩ 10 μΩ/Ω + 760 mΩ 15 μΩ/Ω + 8.2 Ω 50 μΩ/Ω + 180 Ω 500 μΩ/Ω + 2 kΩ 5 mΩ/Ω + 25 kΩ	Agilent / HP 3458A Multimeter
Electrical Simulation of RTD Indicating Devices	R0 = 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 R0 = 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 R0 = 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	0.054 °C 0.054 °C 0.073 °C 0.092 °C 0.11 °C 0.13 °C 0.24 °C 0.044 °C 0.044 °C 0.044 °C 0.054 °C 0.13 °C 0.14 °C 0.15 °C 0.17 °C 0.044 °C 0.054 °C 0.054 °C 0.063 °C 0.083 °C 0.083 °C 0.093 °C 0.12 °C	Fluke 5520A Multiproduct Calibrator





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## Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices	R0 = 1 000 Ω		Fluke 5520A Multiproduct Calibrator
	(-200 to -80) °C	0.037 °C	
	(-80 to 0) °C	0.037 °C	
	(0 to 100) °C	0.045 °C	
	(100 to 260) °C	0.054 °C	
	(260 to 300) °C	0.063 °C	
	(300 to 400) °C	0.073 °C	
	(400 to 600) °C	0.073 °C	
Electrical Simulation of Thermocouple Indicating Devices	Type B		Fluke 5520A Multiproduct Calibrator
	(600 to 800) °C	0.5 °C	
	(800 to 1 000) °C	0.41 °C	
	(1 000 to 1 550) °C	0.37 °C	
	(1 550 to 1 820) °C	0.39 °C	
	Type E		
	(-250 to -100) °C	0.54 °C	
	(-100 to -25) °C	0.25 °C	
	(-25 to 350) °C	0.23 °C	
	(350 to 650) °C	0.25 °C	
	(650 to 1 000) °C	0.28 °C	
	Type J		
	(-210 to -100) °C	0.33 °C	
	(-100 to -30) °C	0.25 °C	
	(-30 to 150) °C	0.23 °C	
	(150 to 760) °C	0.25 °C	
	(760 to 1 200) °C	0.3 °C	
	Type K		
	(-200 to -100) °C	0.39 °C	
	(-100 to -25) °C	0.26 °C	
	(-25 to 120) °C	0.25 °C	
	(120 to 1 000) °C	0.32 °C	
	(1 000 to 1 372) °C	0.44 °C	
	Type N		
	(-200 to -100) °C	0.45 °C	
	(-100 to -25) °C	0.29 °C	
	(-25 to 120) °C	0.27 °C	
	(120 to 410) °C	0.26 °C	
(410 to 1 300) °C	0.33 °C		
Type R			
(0 to 250) °C	0.62 °C		
(250 to 400) °C	0.41 °C		
(400 to 1 000) °C	0.39 °C		
(1 000 to 1 767) °C	0.45 °C		



# ANSI National Accreditation Board

## Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices	Type S		Fluke 5520A Multiproduct Calibrator
	(0 to 200) °C	0.52 °C	
	(200 to 1 000) °C	0.42 °C	
	(1 000 to 1 400) °C	0.42 °C	
	(1 400 to 1 767) °C	0.51 °C	
	Type T		
	(-250 to -150) °C	0.66 °C	
	(-150 to 0) °C	0.31 °C	
(0 to 120) °C	0.25 °C		
(120 to 400) °C	0.23 °C		

## Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Length Standards <sup>2,3</sup>	(1 to 10) in	$(14 + 6.4L) \mu\text{in}$	Gauge Blocks, Supermicrometer,
Calipers <sup>3</sup>	Up to 24 in	$(590 + 6.9L) \mu\text{in}$	Gauge Blocks
Micrometers <sup>3</sup>	Up to 24 in	$(49 + 5.3L) \mu\text{in}$	Gauge Blocks
Dial Indicators	Up to 0.025 in (0.025 to 1) in (1 to 4) in	85 $\mu\text{in}$ 91 $\mu\text{in}$ 140 $\mu\text{in}$	Gauge Blocks, Micrometer Head
Test Indicators	Up to 0.008 in (0.008 to 0.06) in	85 $\mu\text{in}$ 45 $\mu\text{in}$	Gauge Blocks
Micrometer Heads	Up to 1 in	59 $\mu\text{in}$	Gauge Blocks, Electronic Indicator
Height Gages Digital or Dial	Up to 6 in (6 to 12) in	72 $\mu\text{in}$ 98 $\mu\text{in}$	Gauge Blocks, Surface Plate
Pin Gauges <sup>2</sup>	Up to 1 in	20 $\mu\text{in}$	Supermicrometer



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Tensiometers	Up to 200 lbf (200 to 2 000) lbf	0.74 lbf 2.8 lbf	Dead weights Torque Sensor
Torque Wrenches	Up to 10 lbf·in (10 to 100) lbf·in (100 to 200) lbf·in Up to 100 lbf·ft (100 to 2 000) lbf·ft (2 000 to 2 500) lbf·ft	0.06 lbf·in 0.26 lbf·in 0.32 lbf·in 0.15 lbf·ft 2.8 lbf·ft 3.3 lbf·ft	Torque Sensor
Force Gages and Load Cells Tension	Up to 200 lbf (200 to 1 200) lbf	0.035 lbf 0.18 lbf	Dead Weights
	(200 to 1 000) lbf (1 000 to 10 000) lbf (10 000 to 30 000) lbf	0.42 lbf 5.5 lbf 15 lbf	Load Cell
Force Gages and Load Cells Compression	Up to 200 lbf (200 to 1 200) lbf	0.038 lbf 0.2 lbf	Dead Weights
Force Gages and Load Cells Compression	(200 to 1 000) lbf (1 000 to 10 000) lbf (10 000 to 30 000) lbf	0.43 lbf 5.3 lbf 15 lbf	Load Cell
Force Gages and Load Cells Compression <sup>2</sup>	(30 000 to 100 000) lbf	40 lbf	
Scales	Up to 50 lbf (50 to 200) lbf (200 to 1 200) lbf	0.01 lbf 0.04 lbf 0.18 lbf	Class S-1 weights Class F weights Class F weights
	(200 to 1 000) lbf (1 000 to 10 000) lbf (10 000 to 30 000) lbf	0.42 lbf 5.7 lbf 16 lbf	Load Cell
Scales <sup>2</sup>	(30 000 to 100 000) lbf	40 lbf	
Pressure Gauges	Up to 100 psi (35 to 500) psi (500 to 5 000) psi (5 000 to 10 000) psi (10 000 to 15 000) psi	0.08 psi 0.75 psi 11 psi 7 psi 9.1 psi	Setra 370 Pressure Indicators
Vacuum Gauges	Up to 19 psia	0.004 7 psi	Druck DPI 145 Pressure Tester
	(19 to 50) psia	0.032 psi	Setra 370 Pressure Indicator

**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Logic Pulses - Source (0.01, 0.025, 0.1, 0.25, 1, 2.5) V Pulse Width	(4 to 500) ns	34 ms/s + 3.2 ns	Fluke 5520A-SC1100 Multiproduct Calibrator with Keysight 53131A-010
Logic Pulses - Source (0.01, 0.025, 0.1, 0.25, 1, 2.5) V Period	200 ns to 20 ms	100 ns/s + 560 ps	
Time Markers (Spike or Square Wave)	5 nS to 20 mS	100 ns/s + 460 ps	Fluke 5520A-SC1100 Multiproduct Calibrator with Keysight 53131A-010
Frequency Accuracy - Source	0.01 Hz to 1 100 MHz	100 nHz/Hz	Fluke 5520A-SC1100 Multiproduct Calibrator with Keysight 53131A-010
Tachometers	200 000 rpm	0.01 % of reading	Signal Generator with Keysight 53131A-010

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ( $k=2$ ), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for most parameters, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. This parameter is only available at the laboratory facility.
3.  $L$  = length in inches.
4. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1647.



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Vice President

