

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

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CALIBRATION

Valid to: **May 20, 2022**

Certificate Number: **L1002-1**

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Capacitance, Source ¹	(0.19 to 0.4) nF	0.015 nF	Fluke 5520A/SC1100 Multiproduct Calibrator
	(0.4 to 1.1) nF	0.018 nF	
	(1.1 to 3.3) nF	0.028 nF	
	(3.3 to 11) nF	10 nF	
	(11 to 33) nF	10 nF	
	(33 to 110) nF	1.1 nF	
	(110 to 330) nF	10 nF	
	(0.33 to 1.1) μF	11 nF	
	(1.1 to 3.3) μF	16 nF	
	(3.3 to 11) μF	38 nF	
	(11 to 33) μF	160 nF	
	(33 to 110) μF	570 nF	
	(110 to 330) μF	1.8 μF	
	(0.33 to 1.1) mF	5.7 μF	
	(1.1 to 3.3) mF	7.6 μF	
(3.3 to 11) mF	55 μF		
(11 to 33) mF	260 μF		
(33 to 110) mF	1.2 mF		
DC Current, Source ¹	(0 to 330) μA	0.089 nA/μA + 27 nA	Fluke 5520A/SC1100 Multiproduct Calibrator
	(0.3 to 3.3) mA	76 nA/mA + 180 nA	
	(3.3 to 33) mA	73 nA/mA + 1.7 μA	
	(33 to 330) mA	0.07 μA/mA + 18 μA	
	(0.33 to 1.1) A	200 μA/A + 45 μA	
	(1.1 to 3) A	370 μA/A + 86 μA	
	(3 to 11) A	0.180 μA/A + 9.6 mA	
	(11 to 20) A	0.850 mA/A + 6.1 mA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Current, Source ¹	(20 to 50) A (50 to 150) A (150 to 550) A (550 to 1 000) A	4.5 mA/A + 240 mA 6.6 mA/A + 140 mA 7.2 mA/A + 52 mA 7.2 mA/A + 26 mA	Fluke 5520A/SC1100 Multiproduct Calibrator and 50 turn coil
AC Current, Source ¹	(29 to 330) μ A (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 (0.33 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 (10 to 30) kHz (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 (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 (0.33 to 1.1) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (1.1 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	2.1 nA/ μ A + 420 nA 1.5 nA/ μ A + 430 nA 1 nA/ μ A + 430 nA 1.3 nA/ μ A + 5.2 μ A 5.2 nA/ μ A + 5 μ A 2.3 nA/ μ A + 35 μ A 2.3 μ A/mA + 0.98 μ A 1.3 μ A/mA + 0.98 μ A 0.89 μ A/mA + 0.93 μ A 4 μ A/mA + 3.8 μ A 9.2 μ A/mA + 2.8 μ A 8.7 μ A/mA + 29 μ A 2.2 μ A/mA + 4.6 μ A 0.96 μ A/mA + 4.8 μ A 0.68 μ A/mA + 5.6 μ A 2.6 μ A/mA + 5.2 μ A 6.1 μ A/mA + 5.2 μ A 9 μ A/mA + 6.7 μ A 2.2 μ A/mA + 45 μ A 0.97 μ A/mA + 46 μ A 0.42 μ A/mA + 41 μ A 1 μ A/mA + 68 μ A 2.2 μ A/mA + 110 μ A 6.3 μ A/mA + 170 μ A 0.15 μ A/A + 440 μ A 0.15 μ A/A + 440 μ A 1.1 μ A/A + 4.1 mA 21 mA 0.57 mA 0.58 mA/A + 1.7 mA 10 mA/A + 0.6 mA 30 mA/A + 6.1 mA	Fluke 5520A/SC1100 Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Current, Source ¹	(3 to 11) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.7 mA/A + 3.2 mA 3.5 mA 31 mA/A + 2.5 mA	Fluke 5520A/SC1100 Multiproduct Calibrator
	(11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	2 mA/A + 5.5 mA 1.7 mA/A + 6 mA 31 mA/A + 6.6 mA	
AC Current, Source ¹	(20-50) A (45-65) Hz (65-440) Hz	18 mA/A 17 mA/A + 0.019 A	Fluke 5520A/SC1100 Multiproduct Calibrator and 50 turn coil
	(50 to 150) A 45 Hz to 1 kHz (150 to 550) A (45 to 100) Hz (0.1 to 1) kHz (550 to 1 000) A (45 to 100) Hz 100 Hz to 1 kHz	7.5 mA/A + 44 mA 2.9 mA/A + 1 A 7.1 mA/A + 37 mA 7.2 mA/A 20 mA/A + 1.8 A	
DC Current, Measure ¹	(0 to 10) μ A (10 to 100) μ A (100 to 1 000) μ A (1 to 10) mA (10 to 100) mA (100 to 1 000) mA	0.0071 nA/ μ A + 0.67 nA 0.019 nA/ μ A + 0.99 nA 0.019 nA/ μ A + 7.5 nA 18 nA/mA + 76 nA 0.034 μ A/mA + 0.69 μ A 0.11 μ A/mA + 16 μ A	Agilent 3458A System Multimeter
	(1 to 5) A (5 to 10) A (10 to 50) A (50 to 100) A (100 to 150) A	0.001 A 0.0024 A 0.01 A 0.02 A 0.03 A	Agilent 3458A System Multimeter and Current Shunt
AC Current, Measure ¹	(0 to 100) μ A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	4 nA/ μ A + 31 nA 1.5 nA/ μ A + 31 nA 0.59 nA/ μ A + 32 nA 0.59 nA/ μ A + 32 nA	Agilent 3458A System Multimeter

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Current, Measure ¹	(0.1 to 1) mA		Agilent 3458A System Multimeter
	(10 to 20) Hz	4 μ A/mA + 0.2 μ A	
	(20 to 45) Hz	1.5 μ A/mA + 0.2 μ A	
	(45 to 100) Hz	0.6 μ A/mA + 0.2 μ A	
	100 Hz to 5 kHz	0.3 μ A/mA + 0.21 μ A	
	(5 to 20) kHz	0.6 μ A/mA + 0.2 μ A	
	(20 to 50) kHz	4 μ A/mA + 0.4 μ A	
	(50 to 100) kHz	5.5 μ A/mA + 1.5 μ A	
	(1 to 10) mA		
	(10 to 20) Hz	4 μ A/mA + 2 μ A	
	(20 to 45) Hz	1.5 μ A/mA + 2 μ A	
	(45 to 100) Hz	0.6 μ A/mA + 2.1 μ A	
	100 Hz to 5 kHz	0.3 μ A/mA + 2.1 μ A	
	(5 to 20) kHz	0.6 μ A/mA + 2.1 μ A	
	(20 to 50) kHz	4 μ A/mA + 4 μ A	
	(50 to 100) kHz	5.5 μ A/mA + 15 μ A	
	(10 to 100) mA		
	(10 to 20) Hz	4 μ A/mA + 20 μ A	
	(20 to 45) Hz	1.5 μ A/mA + 21 μ A	
	(45 to 100) Hz	0.6 μ A/mA + 21 μ A	
	100 Hz to 5 kHz	0.3 μ A/mA + 21 μ A	
	(5 to 20) kHz	0.6 μ A/mA + 21 μ A	
	(20 to 50) kHz	4 μ A/mA + 40 μ A	
	(50 to 100) kHz	5.5 μ A/mA + 150 μ A	
(100 to 1 000) mA			
(10 to 20) Hz	4 μ A/mA + 200 μ A		
(20 to 45) Hz	1.6 μ A/mA + 210 μ A		
(45 to 100) Hz	0.8 μ A/mA + 210 μ A		
100 Hz to 5 kHz	1 μ A/mA + 210 μ A		
(5 to 20) kHz	3 μ A/mA + 200 μ A		
(20 to 50) kHz	10 μ A/mA + 400 μ A		
(1 to 5) A		Agilent 3458A System Multimeter and Current Shunt	
(45 to 400) Hz	0.0012 A		
(5 to 10) A			
(45 to 400) Hz	0.0024 A		
(10 to 50) A			
(45 to 400) Hz	0.012 A		
(50 to 100) A			
(45 to 400) Hz	0.024 A		
(100 to 150) A			
(45 to 400) Hz	0.036 A		

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Power, Source ¹	(0 to 336) W (336 to 3 060) W (3 060 to 20 910) W	0.14 W 0.054 % of output 0.13 % of output	Fluke 5520A/SC1100 Multiproduct Calibrator
AC Power, Source ¹ (45 to 65) Hz	(0.11 to 3) mW (3 to 11) mW (11 to 30) mW (30 to 110) mW (110 to 300) mW (0.3 to 0.73) W (0.73 to 1.5) W (1.5 to 6.8) W (6.8 to 9.2) W (9.2 to 34) W (34 to 92) W (92 to 337) W (337 to 918) W (918 to 2 244) W (2 244 to 4 590) W (4 590 to 20 910) W	0.19 % of output 0.14 % of output 0.17 % of output 0.12 % of output 0.29 % of output 0.18 % of output 0.28 % of output 0.26 % of output 0.19 % of output 0.14 % of output 0.17 % of output 0.12 % of output 0.29 % of output 0.18 % of output 0.28 % of output 0.26 % of output	Fluke 5520A/SC1100 Multiproduct Calibrator
Resistance Source ¹	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (330 to 1 100) Ω (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ (0.33 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 1 100) MΩ	9.9 mΩ/Ω + 990 mΩ 16 μΩ/Ω + 1.4 mΩ 21 μΩ/Ω + 1.1 mΩ 25 μΩ/Ω + 1.3 mΩ 27 μΩ/Ω + 2.2 mΩ 27 μΩ/Ω + 7.5 mΩ 25 μΩ/Ω + 0.05 Ω 23 μΩ/Ω + 0.24 Ω 25 μΩ/Ω + 0.5 Ω 27 μΩ/Ω + 2.3 Ω 36 μΩ/Ω + 0.2 Ω 75 μΩ/Ω + 9.4 Ω 136 μΩ/Ω + 51 Ω 250 μΩ/Ω + 1.5 kΩ 530 μΩ/Ω + 970 Ω 3.1 mΩ/Ω + 3.8 kΩ 15 mΩ/Ω + 15 kΩ	Fluke 5520A/SC1100 Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Resistance Measure ¹	(0 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (100 to 1 000) MΩ	13 μΩ/Ω + 79 μΩ 11 μΩ/Ω + 700 μΩ 9.7 μΩ/Ω + 0.95 mΩ 9.7 μΩ/Ω + 9.6 mΩ 9.5 μΩ/Ω + 130 mΩ 15 Ω/MΩ + 3.6 Ω 79 Ω/MΩ + 75 Ω 0.5 kΩ/MΩ + 1.5 kΩ 5 kΩ/MΩ + 14 kΩ	Agilent 3458A System Multimeter
Resistance RTD Simulation ¹	Cu 427, 10 Ω (-100 to 260) °C PtNi 385, 120 Ω (-80 to 0) °C (0 to 100) °C (100 to 260) °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 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	0.3 °C 0.081 °C 0.081 °C 0.14 °C 0.25 °C 0.041 °C 0.051 °C 0.061 °C 0.071 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C 0.051 °C 0.051 °C 0.071 °C 0.09 °C 0.1 °C 0.12 °C	Fluke 5520A/SC1100 Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment	
Resistance RTD Simulation ¹	Pt 385, 200 Ω		Fluke 5520A/SC1100 Multiproduct Calibrator	
	(-200 to -80) °C	0.04 °C		
	(-80 to 0) °C	0.04 °C		
	(0 to 100) °C	0.04 °C		
	(100 to 260) °C	0.05 °C		
	(260 to 300) °C	0.12 °C		
	(300 to 400) °C	0.13 °C		
	(400 to 600) °C	0.14 °C		
	(600 to 630) °C	0.16 °C		
	Pt 385, 500 Ω			
	(-200 to -80) °C	0.043 °C		
	(-80 to 0) °C	0.052 °C		
	(0 to 100) °C	0.052 °C		
	(100 to 260) °C	0.062 °C		
	(260 to 300) °C	0.081 °C		
	(300 to 400) °C	0.081 °C		
	(400 to 600) °C	0.091 °C		
	(600 to 630) °C	0.11 °C		
	Pt 385, 1 000 Ω			
	(-200 to -80) °C	0.08 °C		
	(-80 to 0) °C	0.08 °C		
	(0 to 100) °C	0.084 °C		
	(100 to 260) °C	0.089 °C		
	(260 to 300) °C	0.095 °C		
	(300 to 400) °C	0.1 °C		
	(400 to 600) °C	0.1 °C		
	(600 to 630) °C	0.24 °C		
	Pt 385, 100 Ω			
(-200 to -80) °C	0.051 °C			
(-80 to 0) °C	0.051 °C			
(0 to 100) °C	0.071 °C			
(100 to 300) °C	0.09 °C			
(300 to 400) °C	0.1 °C			
(400 to 630) °C	0.12 °C			
(630 to 800) °C	0.23 °C			

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Volts, Source ¹	(0 to 330) mV (0.3 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1 000) V	0.018 μ V/mV + 2.4 μ V 12 μ V/V + 2.7 μ V 11 μ V/V + 64 μ V 18 μ V/V + 470 μ V 21 μ V/V + 4.7 mV	Fluke 5520A/SC1100 Multiproduct Calibrator
AC Volts, Source ¹	(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 (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 (0.33 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 (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 (33 to 330) V 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (330 to 1 000) V 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.88 μ V/mV + 37 μ V 0.17 μ V/mV + 37 μ V 0.29 μ V/mV + 37 μ V 1 μ V/mV + 36 μ V 3.4 μ V/mV + 33 μ V 8 μ V/mV + 61 μ V 0.65 μ V/mV + 51 μ V 0.2 μ V/mV + 37 μ V 0.29 μ V/mV + 38 μ V 0.7 μ V/mV + 38 μ V 1.2 μ V/mV + 50 μ V 2.1 μ V/mV + 92 μ V 640 μ V/V + 270 μ V 210 μ V/V + 110 μ V 310 μ V/V + 110 μ V 0.68 mV/V + 0.11 mV 1.1 mV/V + 0.17 mV 2.5 mV/V + 0.78 mV 0.64 mV/V + 2.7 mV 0.21 mV/V + 1.1 mV 0.41 mV/V + 1.1 mV 0.89 mV/V + 1.1 mV 2.2 mV/V + 1.6 mV 0.64 mV/V + 5.4 mV 0.28 mV/V + 8.8 mV 2.5 mV/V + 5 mV 2.5 mV/V + 7.1 mV 4.5 mV/V + 48 mV 0.68 mV/V + 18 mV 0.38 mV/V + 19 mV 0.41 mV/V + 19 mV	Fluke 5520A/SC1100 Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Voltage, Measure ¹	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	3.5 nV/mV + 2.1 μV 7 μV/V + 1.8 μV 7.9 μV/V + 2.7 μV 9.7 μV/V + 72 μV 22 μV/V + 240 μV	Agilent 3458A System Multimeter
	(10 to 6 000) V	0.02 V/V + 1.7 V	Greenlee 4.5 digit DMM and Fluke 80k-40 HV Probe
AC Voltage, Measure ¹	(1 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 (0.3 to 1) MHz (1 to 4) MHz (4 to 8) MHz (8 to 10) MHz (0.1 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 (0.3 to 1) MHz (1 to 4) MHz (4 to 8) MHz (8 to 10) MHz (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 (0.3 to 1) MHz (1 to 4) MHz (4 to 8) MHz (8 to 10) MHz	0.066 μV/mV + 4.9 μV 0.059 μV/mV + 4 μV 0.13 μV/mV + 3.4 μV 0.29 μV/mV + 3.3 μV 0.77 μV/mV + 6.7 μV 3.0 μV/mV + 12 μV 20 μV/mV + 64 μV 40 μV/mV + 77 μV 40 μV/mV + 87 μV 150 μV/mV + 100 μV 69 μV/V + 44 μV 69 μV/V + 23 μV 140 μV/V + 21 μV 300 μV/V + 24 μV 800 μV/V + 20 μV 3 mV/V + 0.1 mV 20 mV/V + 0.5 mV 40 mV/V + 0.7 mV 40 mV/V + 0.8 mV 150 mV/V + 1 mV 63 μV/V + 560 μV 70 μV/V + 210 μV 140 μV/V + 210 μV 300 μV/V + 210 μV 800 μV/V + 210 μV 3 mV/V + 1 mV 20 mV/V + 5 mV 40 mV/V + 7 mV 40 mV/V + 8 mV 150 mV/V + 10 mV	Agilent 3458A System Multimeter

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage, Measure ¹	(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 (0.3 to 1) MHz	0.2 mV/V + 4.3 mV 0.2 mV/V + 2.2 mV 0.2 mV/V + 2.1 mV 0.35 mV/V + 2.9 mV 1.2 mV/V + 2.1 mV 4 mV/V + 10 mV 15 mV/V + 10 mV	Agilent 3458A System Multimeter
	(100 to 1 000) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 mV/V + 41 mV 0.4 mV/V + 22 mV 0.6 mV/V + 21 mV 1.2 mV/V + 21 mV 3 mV/V + 20 mV	
	(0.01 to 5) kV (45 to 500) Hz	1.9 mV/V + 59 V	Greenlee 4.5 digit DMM and Fluke 80k-40 HV Probe
Millivolt Thermocouple Simulation ¹	Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °C Type C (0 to 150) °C (150 to 650) °C (650 to 1 000) °C (1 000 to 1 800) °C (1 800 to 2 316) °C Type E (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C	0.47 °C 0.38 °C 0.34 °C 0.37 °C 0.34 °C 0.31 °C 0.35 °C 0.53 °C 0.86 °C 0.53 °C 0.23 °C 0.21 °C 0.23 °C 0.26 °C	Fluke 5520A/SC1100 Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Millivolt Thermocouple Simulation ¹	Type J		Fluke 5520A/SC1100 Multiproduct Calibrator
	(-210 to -100) °C	0.31 °C	
	(-100 to -30) °C	0.23 °C	
	(-30 to 150) °C	0.21 °C	
	(150 to 760) °C	0.23 °C	
	(760 to 1 200) °C	0.28 °C	
	Type K		
	(-200 to -100) °C	0.37 °C	
	(-100 to -25) °C	0.24 °C	
	(-25 to 120) °C	0.23 °C	
	(120 to 1 000) °C	0.31 °C	
	(1 000 to 1 372) °C	0.43 °C	
	Type N		
	(-200 to -100) °C	0.43 °C	
	(-100 to -25) °C	0.27 °C	
	(-25 to 120) °C	0.25 °C	
	(120 to 410) °C	0.24 °C	
	(410 to 1 300) °C	0.31 °C	
	Type R		
	(0 to 250) °C	0.59 °C	
(250 to 400) °C	0.38 °C		
(400 to 1 000) °C	0.37 °C		
(1 000 to 1 767) °C	0.43 °C		
Type S			
(0 to 250) °C	0.5 °C		
(250 to 400) °C	0.39 °C		
(400 to 1 000) °C	0.4 °C		
(1 000 to 1 767) °C	0.49 °C		
Type T			
(-250 to -150) °C	0.65 °C		
(-150 to 0) °C	0.29 °C		
(0 to 120) °C	0.23 °C		
(120 to 400) °C	0.21 °C		
Millivolt Thermocouple Measure	Type K (-25 to 120) °C	0.19 m°C/°C + 340 m°C	Fluke 726 Process Calibrator
Oscilloscope DC Voltage, Source ¹ Oscilloscopes into 50 Ω	(0 to 25) mV	100 μV	Fluke 5520A/SC1100 Multiproduct Calibrator
	(25 to 110) mV	330 μV	
	(0.11 to 2.2) V	5.5 mV	
	(2.2 to 6.6) V	17 mV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Oscilloscope DC Voltage, Source ¹ Oscilloscopes into 1 MΩ	(0 to 25) mV (25 to 110) mV (0.11 to 2.2) V (2.2 to 11) V (11 to 130) V	54 μV 54 μV 1.2 mV 5.7 mV 90 mV	Fluke 5520A/SC1100 Multiproduct Calibrator
Oscilloscope Square Wave, Source ¹ Oscilloscopes into 50 Ω	(0 to 25) mV (25 to 110) mV (0.11 to 2.2) V (2.2 to 6.6) V	100 μV 330 μV 5.5 mV 17 mV	
Oscilloscope Square Wave, Source ¹ Oscilloscopes into 1 MΩ	(0 to 25) mV (25 to 110) mV (0.11 to 2.2) V (2.2 to 11) V (11 to 130) V	61 μV 170 μV 2.1 mV 11 mV 140 mV	
Oscilloscope Leveled Sine Wave Amplitude 50 kHz (reference)	5 mV to 5.5 V	23 mV/V + 21 μV	
Oscilloscope Leveled Sine Wave Amplitude 50 kHz to 100 MHz	5 mV to 5.5 V	41 mV/V + 0.3 μV	
Oscilloscope Leveled Sine Wave Amplitude (100 to 300) MHz	5 mV to 5.5 V	41 mV/V + 11 μV	
Oscilloscope Leveled Sine Wave Amplitude (300 to 600) MHz	5 mV to 5.5 V	61 mV/V + 7.8 μV	
Oscilloscope Leveled Sine Wave Amplitude (600 to 1 100) MHz	5 mV to 5.5 V	71 mV/V + 6.7 μV	
Oscilloscope Leveled Sine Wave Flatness Relative to 50 kHz 50 kHz to 100 MHz	5 mV to 5.5 V	20 mV/V + 2.6 μV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Oscilloscope Leveled Sine Wave Flatness Relative to 50 kHz (100 to 300) MHz	5 mV to 5.5 V	24 mV/V + 2.1 μ V	Fluke 5520A/SC1100 Multiproduct Calibrator
Oscilloscope Leveled Sine Wave Flatness Relative to 50 kHz (300 to 600) MHz	5 mV to 5.5 V	43 mV/V + 1.2 μ V	
Oscilloscope Leveled Sine Wave Flatness Relative to 50 kHz (600 to 1 100) MHz	5 mV to 3.5 V	52 mV/V + 2.9 μ V	
Oscilloscope Level Sine Wave Frequency	50 kHz 1 100 MHz	2.7 Hz 1 MHz	
Oscilloscope Leading Edge Risetime ¹ 1 kHz to 10 MHz 5 mV to 2.5 V	(200 to 350) ps	320 ps	
Oscilloscope Time Markers ¹	1 nS to 20 ms 50 ms 0.1 s 0.2 s 0.5 s 1 s 2 s 5 s	2.7 μ s/s 3.8 μ s 13 μ s 45 μ s 260 μ s 1 ms 4.1 ms 25 ms	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Caliper Checker ²	(0 to 72) in	(42 + 3.3L) μ in	Gage Blocks / Electronic Amp
Geometric References Flatness, Parallelism, Straightness	(1 to 36) in (36 to 60) in	58 μ in 87 μ in	Gage Blocks / Electronic Amp
Gage Blocks, Steel ²	(0.01 to 4) in	(6 + 0.21L) μ in	Gage Block Comparator

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Gage Blocks, Steel ²	(5 to 20) in	(5 + 0.86L) μin	Johansson Comparator & Surface Plate
Gage Blocks, TC/CC/Ceramic ²	(0.01 to 4) in	(3.8 + 4.2L) μin	Gage Block Comparator
Gage Block Comparator	0.01 in	4 μin	Gage Blocks
Kalmaster ²	(0 to 12) in	(42 + 3.3L) μin	Gage Blocks / Electronic Amp
Length Standards ^{1,2}	(0 to 20) in	(42 + 3.3L) μin	
Micrometer Master, Depth ²	(0 to 12) in	(42 + 3.3L) μin	
Micrometer Master, OD ²	(0 to 12) in	(42 + 3.3L) μin	
Optical Flats and Parallels			Master Optical Flat Gage Block Comparator
Flatness	(1 to 6) inD ³	3.3 μin	Electronic Amp / Surface Plate
Parallelism	Up to 1 in	6 μin	
Parallels	(0 to 36) in	58 μin	Electronic Amp / Surface Plate
	(36 to 60) in	87 μin	
Pitch Gages (1 to 100) TPI ²	(0 to 0.1) in	(430 + 17L) μin	Optical Comparator
Plain Plug Gage ^{1,2}	(0 to 14) in	(22 + 1.9D) μin	Labmaster Universal
Plain Ring Gage ^{1,2}	(0.05 to 0.5) in	8.1 μin	Labmaster Universal
	(0.5 to 14) in	(7.7 + 3D) μin	
Steel Ball (size only) ²	(0.05 to 1) in	(22 + 1.9D) μin	Supermic / Gage Blocks
Steel Rule ^{1,2}	(1 to 48) in	(5 700 + 2.3L) μin	Gage Blocks
	(48 to 144) in	(5 700 + 1.5L) μin	
Straight Edge	(1 to 36) in	58 μin	Elec Amp/Surface Plate
	(36 to 60) in	87 μin	
Thickness / Feeler / Pin Gages ^{1,2}	(0.001 to 1) in	(22 + 1.9D) μin	Supermic
Thread Measuring Wires	(0 to 0.25) in	31 μin	Supermic
1-2-3 Blocks ²	(1 to 3) in	(42 + 3.3L) μin	Electronic Amp / Gage Blocks

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Angle Gage Blocks	(0 to 45) °	6.4 s	Sine Bar / Electronic Amp
Arbors	(0 to 14) in	58 μin	Supermic / Bench Center / Amp
Fixtures/Functional Gages ²	(0 to 6) in	(610 + 1.8L) μin	Optical Comparator
	(0 to 360) °	0.065 °	
Protractor ¹	(0 to 360) °	0.065 °	Optical Comparator
	(0 to 45) °	6.4 ”	Sine Bar / Gage Blocks
Radius Gage ²	(0.015 6 to 2) in	(610 + 1.8L) μin	Optical Comparator
Sine Plates/Bars ²	(5 to 20) in	(68 + 12L) μin	Electronic Amp, Surface Plate, Gage Blocks
Squares ^{1,2}	(1 to 24) in	(48 + 3.5L) μin	Granite Square / Electronic Amp
V Blocks	Up to 12 in ³	150 μin	Elec Amp, Arbor, Surface Plate, Square
NPT Thread Ring ²	(0.062 5 to 2.5) in	(190 + 1.5D) μin	NPT Plugs
NPTF Taper Plugs ²	(0.062 5 to 6) in	(55 + 2.3D) μin	Supermic / Sine Block
Surface Finish Standard ^{1,2}	(12 to 1 000) μin Ra	(4 + 0.0085H) μin	Profilometer
Thread Plugs ^{1,2} (6 to 80) TPI	(0 to 14) in	(130 + 2PD) μin	Supermic / Thread Wires
Surface Plates ^{1,2} Repeatability Flatness	0.002 in (24 to 144) in	(34 + 0.1L) μin (48 + 0.091L) μin	Repeat Reading Gage Autocollimator
Thread Plug Gage, tapered ²	(0.125 to 6) in	(130 + 2D) μin	Supermic / Thread Wires / Sine Block
Thread Ring Gage ^{1,2} (6 to 80) TPI	(0.1 to 1.5) in	(190 + 1.5PD) μin	Set Plugs
	(0.2 to 5) in	(200 + 1.1PD) μin	Zeiss ULM
Fixtures / Functional Gages	X Axis to 28 in Y Axis to 28 in Z Axis to 24 in	430 μin 430 μin 440 μin	CMM incorporated in Measurement Process
Plain Taper Arbor	(0 to 20) in	430 μin	CMM

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Bench Micrometer ^{1,2}	(0 to 2) in	(48 + 11L) μin	Gage Blocks
Calipers ^{1,2} Resolution: 0.000 5 in Resolution: 0.001 in	(0 to 24) in	(450+6L) μin (670+4L) μin	Gage Blocks / Ring Gage
Resolution: 0.001 in	(24 to 72) in	(350 + 15L) μin	
Dial Bore Gage ¹	(1 to 10) in	41 μin	Supermic
Dial Indicator Calibrator ²	(0 to 1) in	(16 + 1.1L) μin	Gage Blocks / Electronic Amp
Dial/Test/Elect Indicators ^{1,2} Resolution: 0.000 04 in Resolution: 0.000 05 in Resolution: 0.000 08 in Resolution: 0.000 1 in Resolution: 0.000 5 in Resolution: 0.001 in	(0 to 4) in	(50 + 8L) μin (53 + 8L) μin (64 + 7L) μin (73 + 6L) μin (290 + 2L) μin (580 + 1L) μin	Gage Blocks
Electronic Amp ²	(0 to 0.008) in	(75 + 110L) μin	Gage Blocks
	(0 to 0.008) in	(9.9 + 3.5L) μin	Zeiss ULM
Height Gage ^{1,2}	(0 to 48) in	(44 + 6.4L) μin	Gage Blocks
Height Master ^{1,2}	(0 to 48) in	(42 + 3.3L) μin	Gage Blocks / Electronic Amp
Intramic / Bore Mic ²	(0.2 to 6) in	(150 + 27D) μin	Ring Gages
High Precision Indicators	0.002 in	3.5 μin	Grade 1 Gage Blocks
Micrometer, ID ^{1,2}	(0 to 12) in	(21 + 2.5L) μin	Supermic
	(12 to 60) in	(42 + 3.3L) μin	Gage Blocks / Electronic Amp
Micrometer, OD ^{1,2} Resolution:0.000 05 in Resolution:0.000 1 in Resolution:0.001 in	(0 to 24) in	(50 + 14L) μin (70 + 13L) μin (120 + 11L) μin	Gage Blocks
	Resolution:0.001 in (25 to 72) in	(47 + 11L) μin	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Micrometer, Depth ^{1,2}	(0 to 24) in	(110 + 8L) μin	Gage Blocks
Micrometer Head	(0 to 2) in	24 μin	Zeiss ULM
Supermic, OD ^{1,2}	(0 to 1) in (1 to 3) in (3 to 6) in (6 to 12) in (12 to 18) in	(19 + 5L) μin (12 + 1.7L) μin (5.2 + 4L) μin (5.5 + 4L) μin (2.5 + 4.2L) μin	Gage Blocks
Laser Micrometer ²	(0 to 1) in	(36 + 14L) μin	Master Pins
Bench Centers ¹	(0 to 48) in	140 μin	Arbor / Electronic Amp
Dial Sink/ Counter bore Gage	(0 to 2) in	130 μin	Ring Gage
Levels	14 in	290 μin	Surface Plate
Optical Comparator ^{1,2} Linear	(0 to 6) in	(430 + 17L) μin	Glass Scale
Optical Comparator ¹ Angular	(0 to 360) °	0.02°	
Profilometer ^{1,2}	(12 to 120) μin Ra	(3.6 + 0.005 7H) μin	3 Patch Surface Finish Standard

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Force Gage	(0 to 6 000) g	(5.6 μg + 20 μg/g)	ASTM E617 Class 7 Weights
	(0.5 to 220) lbf	0.000 035 lb/lb	NIST Class F Weights
Durometer Force Type A Type D Type M	(0 to 90) Duro (0 to 90) Duro (0 to 90) Duro	1.3 Duro 1.4 Duro 0.6 Duro	Comparison to Scale
Microhardness Testers ¹ 500 gf load Knoop	Low Middle High	5.3 HK 18 HK 12 HK	ASTM E-384 Indirect Verification
Vickers	Middle	19 HV	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Brinell Hardness Testers ¹	500 kgf load		ASTM-E-10 Indirect Verification
	Low	4.5 HB	
	Middle	4.9 HB	
	High	5.3 HB	
	1 500 kgf load		
	Low	4.7 HB	
	Middle	5.3 HB	
	High	5.4 HB	
	3 000 kgf load		
Low	7.4 HB		
Middle	6.4 HB		
High	6.4 HB		
Rockwell Hardness Testers ¹	HRA		ASTM-E-18 Indirect Verification
	Low	0.71 HRA	
	Middle	0.56 HRA	
	High	0.47 HRA	
	HRBW		
	Low	1.1 HRBW	
	Middle	0.94 HRBW	
	High	0.71 HRBW	
	HRC		
Low	0.74 HRC		
Middle	0.53 HRC		
High	0.47 HRC		
Rockwell Superficial Hardness Testers ¹	HR15TW		ASTM-E-18 Indirect Verification
	Low	1 HR15TW	
	Middle	1 HR15TW	
	High	0.8 HR15TW	
	HR30TW		
	Low	0.9 HR30TW	
	Middle	1 HR30TW	
	High	0.86 HR30TW	
	HR45TW		
	Low	0.64 HR45TW	
	Middle	0.87 HR45TW	
	High	0.7 HR45TW	
	HR15N		
	Low	0.73 HR15N	
	Middle	0.84 HR15N	
High	0.74 HR15N		

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Rockwell Superficial Hardness Testers ¹	HR30N Low Middle High HR45N Low Middle High	0.85 HR30N 0.9 HR30N 0.79 HR30N 0.79 HR45N 0.76 HR45N 0.8 HR45N	ASTM-E-18 Indirect Verification
Pressure	(5 to 2 000) psi (25 to 10 000) psi	(0.24 + 0.015x) psi (0.71 + 0.000 06x) psi	Deadweight Tester
	(-12.3 to 300) psi	(0.025 + 0.002 8x) psi	Pneumatic Pressure Calibrator
Weighing System ¹ (0.001 g resolution) (0.001 lb resolution)	(0 to 6 000) g (0 to 12) lb	5.6 µg + 20 µg/g 0.001 5 lb	ASTM E617 Class 7 Weights and NIST Handbook 44 utilized for the calibration of the Weighing System
Weighing System 0.001 lb resolution 0.01 lb resolution 0.1 lb resolution 1 lb resolution 2 lb resolution	(0 to 220) lb	0.000 035 lb/lb 0.005 5 lb + 0.000 011 lb/lb 0.058 lb 0.58 lb 1.2 lb	NIST Class F Weights and NIST Handbook 44 utilized for the calibration of the Weighing System
Weighing System ² Floor Scales	Up to 3 000 lb	0.001 1 lbs/lb + 0.6R	E617 Class 6 Weights
Weighing System Lab Balances Resolution: 0.000 1 g	(1 to 1000) g (1 to 2) kg (2 to 3) kg (3 to 5) kg (5 to 13) kg	0.2 mg 0.23 mg 0.27 mg 0.39 mg 0.47 mg	Class 1 Weights
0.001g	(1 to 2 000) g (2 to 13) kg	2.1 mg 2.2 mg	
0.01g	1 g to 13 kg	8.4 mg	
0.1g	1 g to 13 kg	58 mg	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Torque Watches ²	(1 to 80) ozf·in	(0.11 + 0.002 4x) ozf·in	Torque Wheels and Class F Weights
Torque Transducer / Calibrator ²	(5 to 50) ozf·in (15 to 200) ozf·in (4 to 50) lbf·in (30 to 400) lbf·in (80 to 1 000) lbf·in (20 to 250) lbf·ft (60 to 600) lbf·ft (100 to 1 000) lbf·ft (200 to 2 000) lbf·ft	0.006 ozf·in/ozf·in (0.001 9 + 0.005 7x) ozf·in (0.008 6 + 0.005 6x) lbf·in (0.001 2 + 0.005 3x) lbf·in (0.005 6 + 0.006 2x) lbf·in (0.002 5 + 0.001 3x) lbf·ft (0.011 + 0.008 3x) lbf·ft (0.008 9 + 0.008 3) lbf·ft (0.021 + 0.008 3x) lbf·ft	
Torque Tools ^{1,2}	(5 to 50) ozf·in (15 to 200) ozf·in (4 to 50) lbf·in (30 to 400) lbf·in (80 to 1 000) lbf·in (20 to 250) lbf·ft (60 to 600) lbf·ft (100 to 1 000) lbf·ft (200 to 2 000) lbf·ft	(0.033 + 0.018x) ozf·in (0.61 + 0.006 3x) ozf·in (0.052 + 0.007 1x) lbf·in 0.72 lbf·in (1.7 + 0.012x) lbf·in (0.61 + 0.007 9x) lbf·ft (4 + 0.002 1x) lbf·ft (1.2 + 0.013x) lbf·ft (17 + 0.001 5x) lbf·ft	

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Humidity Source	(11, 35, 75) +/- 5 %RH	1.3 %RH + 0.000 47 %RH/%RH	Saturated Salts & Thermohygrometer
Humidity – Measure ¹	(5 to 90) %H	1.5 % RH	Thermohygrometer
Temperature Generate	(-40 to 250) °C	0.12 °C	Temperature Bath & SPRT
Temperature Generate	(50 to 250) °C	46 m°C + 4.7 μ°C/°C	Drywell calibrator & SPRT
Temperature - Measure	(20 to 25) °C	0.42 °C	Vaisala
	(0 to 200) °C	74 m°C + 130 μ°C/°C	Process Calibrator with Type K TC probe
	(-40 to 250) °C	0.049 °C	Instrulab Indicator & PRT


Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Stopwatches and Timers	(0 to 3) h	0.04 s	Frequency Counter
Tachometers Electronic / Non-Contact	(0 to 119) RPM (120 to 999) RPM (1 000 to 1 199) RPM (1 200 to 12 000) RPM (12 000 to 99 999) RPM	0.082 RPM 0.1 RPM 0.82 RPM 1 RPM 6.5 RPM	Fluke 5520A Multifunction Calibrator
Frequency, Source ¹	(0.010 to 12) kHz	0.38 μ Hz/Hz + 5.7 mHz	Fluke 5520A/SC1100 Multiproduct Calibrator
	(12 to 500) kHz	2.7 μ Hz/Hz + 34 mHz	
Frequency, Source	10 MHz	4.6 Hz	HP 5335A Counter
Frequency, Measure ¹	(1 to 40) Hz	520 μ Hz/Hz + 0.001 3 μ Hz	Agilent 3458A Multimeter
	(0.04 to 10) kHz	0.17 Hz/kHz	
	(10 to 100) kHz	0.17 Hz/kHz	
	(0.1 to 1) MHz	170 mHz/MHz + 0.034 μ Hz	

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 this parameter, 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. L = Length in inches, D = Diameter in inches, PD = Pitch Diameter in inches, H = Height in inches, x = value of reading, R = resolution of unit under test.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. L1002-1.



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