



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

Brylen Technologies, Inc.

275 Orange Avenue #A

Goleta, CA 93117

has been assessed by ANAB and meets the requirements of international standard

ISO/IEC 17025:2005

and national standards

**ANSI/NCSL Z540-1-1994 (R2002) AND
ANSI/NCSL Z540.3-2006 (R2013)**

while demonstrating technical competence in the field of

CALIBRATION AND TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of calibrations to which this accreditation applies.

ACT-1201
Certificate Number


ANAB Approval

Certificate Valid: 07/11/2018-07/11/2020
Version No. 005 Issued: 07/11/2018



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. 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).



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005,
ANSI/NCSL Z540-1-1994 (R2002), AND ANSI/NCSL Z540.3-2006 (R2013)**

Brylen Technologies, Inc.

275 Orange Avenue #A
Goleta, CA 93117
Barbara Tzur 805-692-9300

CALIBRATION

Valid to: **July 11, 2020**

Certificate Number: **ACT-1201**

Calibration

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Voltage – Source ^{1,3}	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V 330 V to 1.02 kV	45 μ V/V + 2.4 μ V 27 μ V/V + 50 μ V 27 μ V/V + 50 μ V 31 μ V/V + 4.9 mV 41 μ V/V + 2.5 mV	Fluke 5500A SC600 Multiproduct Calibrator
DC Voltage – Measure ^{1,3}	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	7.8 μ V/V + 350 nV 6.8 μ V/V + 350 nV 6.8 μ V/V + 650 nV 9 μ V/V + 40 μ V 8.8 μ V/V + 1.1 mV	HP 3458A Opt 002 Multimeter
DC Current – Source ^{1,3}	Up to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 2.2 A (2.2 to 11) A	91 μ A/A + 68 nA 68 μ A/A + 496 nA 69 μ A/A + 5.3 μ A 225 μ A/A + 109 μ A 447 μ A/A + 625 μ A	Fluke 5500A SC600 Multiproduct Calibrator
DC Current – Measure ^{1,3}	Up to 100 nA 100 nA to 1 μ A (1 to 10) μ A (10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	39 μ A/A + 46 pA 30 μ A/A + 46 pA 27 μ A/A + 130 pA 28 μ A/A + 91 pA 28 μ A/A + 5.7 nA 28 μ A/A + 57 nA 45 μ A/A + 570 nA 130 μ A/A + 11 μ A	HP 3458A Opt 002 Multimeter



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage – Source ^{1,3}	Up to 33 mV		Fluke 5500A SC600 Multiproduct Calibrator
	(10 to 45) Hz	2.6 mV/V + 16 μV	
	45 Hz to 10 kHz	1.1 mV/V + 16 μV	
	(10 to 20) kHz	1.5 mV/V + 16 μV	
	(20 to 50) kHz	1.9 mV/V + 16 μV	
	(50 to 100) kHz	2.7 mV/V + 26 μV	
	(100 to 500) kHz	4.6 mV/V + 46 μV	
	(33 to 330) mV		
	(10 to 45) Hz	1.9 mV/V + 38 μV	
	45 Hz to 10 kHz	379 μV/V + 16 μV	
	(10 to 20) kHz	760 μV/V + 16 μV	
	(20 to 50) kHz	1.2 mV/V + 31 μV	
	(50 to 100) kHz	1.8 mV/V + 129 μV	
	(100 to 500) kHz	5.3 mV/V + 251 μV	
	330 mV to 3.3 V		
	(10 to 45) Hz	1.1 mV/V + 196 μV	
	45 Hz to 10 kHz	224 μV/V + 60 μV	
	(10 to 20) kHz	607 μV/V + 53 μV	
	(20 to 50) kHz	1.1 mV/V + 232 μV	
	(50 to 100) kHz	1.8 mV/V + 1.3 mV	
	(100 to 500) kHz	3.8 mV/V + 2.5 mV	
	(3.3 to 33) V		
	(10 to 45) Hz	1.1 mV/V + 1.9 mV	
	45 Hz to 10 kHz	300 μV/V + 645 μV	
(10 to 20) kHz	6.1 μV/V + 2.1 mV		
(20 to 50) kHz	1.4 mV/V + 3.8 mV		
(50 to 100) kHz	1.8 mV/V + 13 mV		
(33 to 330) V			
45 Hz to 1 kHz	380 μV/V + 6.1 mV		
(1 to 10) kHz	610 μV/V + 12 μV		
(10 to 20) kHz	680 μV/V + 26 μV		
330 V to 1.02 kV			
45 Hz to 1 kHz	380 μV/V + 61 mV		
(1 to 5) kHz	1.5 mV/V + 76 mV		
(5 to 10) kHz	1.5 mV/V + 380 mV		



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage – Measure ^{1,3}	Up to 10 mV		HP 3458A Opt 002 Multimeter
	(1 to 40) Hz	340 μ V/V + 2 μ V	
	40 Hz to 1 kHz	229 μ V/V + 226 nV	
	(1 to 20) kHz	342 μ V/V + 1 μ V	
	(20 to 50) kHz	1.1 mV/V + 1 μ V	
	(50 to 100) kHz	5.7 mV/V + 1 μ V	
	(100 to 300) kHz	45 mV/V + 2 μ V	
	300 kHz to 1 MHz	14 mV/V + 6 μ V	
	(1 to 4) MHz	73 mV/V + 8 μ V	
	(4 to 8) MHz	226 mV/V + 9 μ V	
	(10 to 100 mV)		
	(1 to 40) Hz	82 μ V/V + 4.5 μ V	
	40 Hz to 1 kHz	82 μ V/V + 2.3 μ V	
	(1 to 20) kHz	161 μ V/V + 2.3 μ V	
	(20 to 50) kHz	342 μ V/V + 2.3 μ V	
	(50 to 100) kHz	910 μ V/V + 2.3 μ V	
	(100 to 300) kHz	342 μ V/V + 11 μ V	
	300 kHz to 1 MHz	11 mV/V + 11 μ V	
	(1 to 4) MHz	45 mV/V + 79 μ V	
	(4 to 8) MHz	45 mV/V + 91 μ V	
	(8 to 10) MHz	170 mV/V + 113 μ V	
	100 mV to 1 V		
	(1 to 40) Hz	82 μ V/V + 45 μ V	
	40 Hz to 1 kHz	82 μ V/V + 23 μ V	
(1 to 20) kHz	160 μ V/V + 23 μ V		
(20 to 50) kHz	342 μ V/V + 23 μ V		
(50 to 100) kHz	908 μ V/V + 23 μ V		
(100 to 300) kHz	342 μ V/V + 113 μ V		
300 kHz to 1 MHz	11 mV/V + 113 μ V		
(1 to 4) MHz	46 mV/V + 792 μ V		
(4 to 8) MHz	45 mV/V + 905 μ V		
(8 to 10) MHz	170 mV/V + 1.1 mV		



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage – Measure ^{1,3}	(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 4) MHz (4 to 8) MHz (8 to 10) MHz	82 $\mu\text{V/V} + 453 \mu\text{V}$ 82 $\mu\text{V/V} + 226 \mu\text{V}$ 161 $\mu\text{V/V} + 226 \mu\text{V}$ 342 $\mu\text{V/V} + 226 \mu\text{V}$ 908 $\mu\text{V/V} + 226 \mu\text{V}$ 342 $\mu\text{V/V} + 1.1 \text{ mV}$ 11 $\text{mV/V} + 1.1 \text{ mV}$ 45 $\text{mV/V} + 7.9 \text{ mV}$ 45 $\text{mV/V} + 9.1 \text{ mV}$ 107 $\text{mV/V} + 11 \text{ mV}$	HP 3458A Opt 002 Multimeter
	(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 100 to 1 kV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	229 $\mu\text{V/V} + 4.5 \text{ mV}$ 229 $\mu\text{V/V} + 2.3 \text{ mV}$ 229 $\mu\text{V/V} + 2.3 \text{ mV}$ 398 $\mu\text{V/V} + 2.3 \text{ mV}$ 1.4 $\text{mV/V} + 2.3 \text{ mV}$ 4.5 $\text{mV/V} + 11 \text{ mV}$ 17 $\text{mV/V} + 11 \text{ mV}$ 455 $\mu\text{V/V} + 45 \text{ mV}$ 455 $\mu\text{V/V} + 23 \text{ mV}$ 681 $\mu\text{V/V} + 23 \text{ mV}$ 1.4 $\text{mV/V} + 23 \text{ mV}$ 3.4 $\text{mV/V} + 23 \text{ mV}$	
AC Current – Source ^{1,3}	(30 to 330) μA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 330 μA 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	1.9 $\text{mA/A} + 126 \text{ nA}$ 922 $\mu\text{A/A} + 127 \text{ nA}$ 935 $\mu\text{A/A} + 198 \text{ nA}$ 3 $\text{mA/A} + 126 \text{ nA}$ 9.5 $\text{mA/A} + 122 \text{ nA}$ 1.5 $\text{mA/A} + 230 \text{ nA}$ 760 $\mu\text{A/A} + 230 \text{ nA}$ 760 $\mu\text{A/A} + 230 \text{ nA}$ 1.5 $\text{mA/A} + 230 \text{ nA}$ 4.6 $\text{mA/A} + 230 \text{ nA}$	Fluke 5500A SC600 Multiproduct Calibrator



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Current - Source ^{1,3}	(3.3 to 33) mA		Fluke 5500A SC600 Multiproduct Calibrator
	(10 to 20) Hz	1.5 mA/A + 2.3 µA	
	(20 to 45) Hz	760 µA/A + 2.3 µA	
	45 Hz to 1 kHz	680 µA/A + 2.3 µA	
	(1 to 5) kHz	1.5 mA/A + 2.3 µA	
	(5 to 10) kHz	4.6 mA/A + 2.3 µA	
	(33 to 330) mA		
	(10 to 20) Hz	1.5 mA/A + 23 µA	
	(20 to 45) Hz	760 µA/A + 23 µA	
	45 Hz to 1 kHz	680 µA/A + 23 µA	
	(1 to 5) kHz	1.5 mA/A + 23 µA	
	(5 to 10) kHz	4.6 mA/A + 23 µA	
	330 mA to 2.2 A		
	(10 to 45) Hz	1.5 mA/A + 230 µA	
45 Hz to 1 kHz	760 µA/A + 230 µA		
(1 to 5) kHz	5.7 mA/A + 230 µA		
(2.2 to 11) A			
(45 to 65) Hz	450 µA/A + 1.6 mA		
65 Hz to 500 Hz	757 µA/A + 1.6 mA		
500 Hz to 1 kHz	2.5 mA/A + 1.6 mA		
AC Current – Measure ^{1,3}	(5 to 100) µA		HP 3458A Opt 002 Multimeter
	(10 to 20) Hz	4.5 mA/A + 34 nA	
	(20 to 45) Hz	1.7 mA/A + 23 nA	
	(45 to 100) Hz	684 µA/A + 34 nA	
	100 Hz to 1 kHz	676 µA/A + 35 nA	
	100 µA to 1 mA		
	(10 to 20) Hz	4.5 mA/A + 226 nA	
	(20 to 45) Hz	1.7 mA/A + 226 nA	
	(45 to 100) Hz	684 µA/A + 226 nA	
	100 Hz to 5 kHz	334 µA/A + 245 nA	
	(5 to 20) kHz	684 µA/A + 226 nA	
	(20 to 50) kHz	4.5 mA/A + 453 µA	
	(50 to 100) kHz	6.3 mA/A + 8 µA	



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Current – Measure ^{1,3}	(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	4.5 mA/A + 2.3 μA 1.7mA/A + 2.3 μA 684 μA /A + 2.3 μA 334 μA /A + 2.5 μA 684 μA /A + 2.3 μA 4.5 mA/A + 4.5 μA 6.3 mA/A + 80 μA	HP 3458A Opt 002 Multimeter
	(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	4.5 mA/A + 23 μA 1.7 mA/A + 23 μA 685 μA/A + 23 μA 334 μA/A + 25 μA 684 μA/A + 2.3 μA 4.5 mA/A + 45 μA 6.2 mA/A + 170 μA	
Resistance – Source ^{1,3}	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	4.5 mA/A + 226 μA 1.8 mA/A + 226 μA 910 μA/A + 226 μA 112 μA/A + 247 μA 3.4 mA/A + 223 μA 11 mA/A + 453 μA	Fluke 5500A SC600 Multiproduct Calibrator
	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ	69 μΩ/Ω + 8 mΩ 84 μΩ/Ω + 13 mΩ 64 μΩ/Ω + 13 mΩ 67 μΩ/Ω + 12 mΩ 58 μΩ/Ω + 70 mΩ 65 μΩ/Ω + 63 mΩ 58 μΩ/Ω + 698 mΩ 65 μΩ/Ω + 620 mΩ 80 μΩ/Ω + 6.8 Ω 81 μΩ/Ω + 6 Ω 102 μΩ/Ω + 64 Ω 50 μΩ/Ω + 538 Ω 420 μΩ/Ω + 960 Ω 702 μΩ/Ω + 3.0 kΩ 3.8 mΩ/Ω + 5.3 kΩ 3.8 mΩ/Ω + 12.6 kΩ	



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Resistance – Source ^{1,3} Fixed Values	500 $\mu\Omega$ 2 m Ω 5 m Ω 10 m Ω	5.7 $\mu\Omega$ 23 $\mu\Omega$ 57 $\mu\Omega$ 113 $\mu\Omega$	Simpson Current Shunts
Resistance – Measure ^{1,3}	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	18 $\mu\Omega/\Omega$ + 79 $\mu\Omega$ 17 $\mu\Omega/\Omega$ + 580 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 680 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 2.1 m Ω 15 $\mu\Omega/\Omega$ + 30 m Ω 20 $\mu\Omega/\Omega$ + 2.4 Ω 59 $\mu\Omega/\Omega$ + 130 Ω 600 $\mu\Omega/\Omega$ + 1.6 k Ω 5.6 m Ω/Ω + 54 k Ω	HP 3458A Opt 002 Multimeter
Capacitance – Source ^{1,3} 10 Hz to 10 kHz 10 Hz to 3 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 (0 to 50) Hz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	(330 to 500) pF 500 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF 330 nF to 1.1 μ F (1.1 to 3.3) μ F (3.3 to 11) μ F (11 to 33) μ F (33 to 110) μ F (110 to 330) μ F 330 μ F to 1.1 mF	3.8 mF/F + 7.6 pF 3.8 mF/F + 7.6 pF 3.8 mF/F + 7.6 pF 3.8 mF/F + 8.6 pF 1.9 mF/F + 76 pF 1.8 mF/F + 90 pF 1.9 mF/F + 230 pF 1.9 mF/F + 820 pF 2.7 mF/F + 2.3 nF 2.6 mF/F + 8.8 nF 3.0 mF/F + 23 nF 3.8 mF/F + 86 nF 5.3 mF/F + 230 nF 7.3 mF/F + 310 nF	Fluke 5500A SC600 Multiproduct Calibrator
Inductance-Source ^{1,3}	0 to 999.999 mH	23 mH/H + 90 nH	IET LC-400L-SC Decade Inductor
Electrical Simulation of Thermocouple Indicators ^{1,3}	Type B (600-800) $^{\circ}$ C (800 to 1 000) $^{\circ}$ C (1 000 to 1 550) $^{\circ}$ C (1 550 to 1 820) $^{\circ}$ C	0.33 $^{\circ}$ C 0.26 $^{\circ}$ C 0.23 $^{\circ}$ C 0.25 $^{\circ}$ C	Fluke 5500A SC600 Multiproduct Calibrator



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Electrical Simulation of Thermocouple Indicators ^{1,3}	Type C		Fluke 5500A SC600 Multiproduct Calibrator
	(0 to 15) °C	0.23 °C	
	(150 to 650) °C	0.2 °C	
	(650 to 1 000) °C	0.24 °C	
	(1 000 to 1 800) °C	0.38 °C	
	(1 800 to 2 316) °C	0.64 °C	
	Type E		
	(-250 to -100) °C	0.38 °C	
	(-100 to -25) °C	0.12 °C	
	(-25 to 350) °C	0.11 °C	
	(350 to 650) °C	0.12 °C	
	(650 to 1 000) °C	0.16 °C	
	Type J		
	(-210 to -100) °C	0.21 °C	
	(-100 to -30) °C	0.12 °C	
	(-30 to 150) °C	0.11 °C	
	(150 to 760) °C	0.13 °C	
	(760 to 1 200) °C	0.18 °C	
	Type K		
	(200 to -100) °C	0.25 °C	
	(-100 to -25) °C	0.14 °C	
	(-25 to 120) °C	0.12 °C	
	(120 to 1 000) °C	0.2 °C	
	(1 000 to 1 372) °C	0.3 °C	
	Type L		
	(200 to -100) °C	0.28 °C	
	(-100 to 800) °C	0.2 °C	
	(800 to 900) °C	0.13 °C	
Type N			
(-200 to -100) °C	0.3 °C		
(-100 to -25) °C	0.17 °C		
(-25 to 120) °C	0.15 °C		
(120 to 410) °C	0.14 °C		
(410 to 1 300) °C	0.21 °C		
Type R			
(0 to 250) °C	0.43 °C		
(250 to 400) °C	0.27 °C		
(400 to 1 000) °C	0.25 °C		
(1 000 to 1 767) °C	0.3 °C		



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment		
Electrical Simulation of Thermocouple Indicators ^{1,3}	Type S (0 to 250) °C	0.36 °C	Fluke 5500A SC600 Multiproduct Calibrator		
	(250 to 1 000) °C	0.27 °C			
	(1 000 to 1 400) °C	0.28 °C			
	(1 400 to 1 767) °C	0.35 °C			
	Type T (-250 to -150) °C	0.48 °C			
	(-150 to 0) °C	0.18 °C			
	(0 to 120) °C	0.12 °C			
	(120 to 400) °C	0.11 °C			
	Type U (-200 to 0) °C	0.43 °C			
	(0 to 600) °C	0.21 °C			
	Electrical Simulation of RTD Indicators ^{1,3}	Pt 395 (100 Ω) (-200 to 0) °C		0.038 °C	Fluke 5500A SC600 Multiproduct Calibrator
		(0 to 100) °C		0.038 °C	
(100 to 300) °C		0.053 °C			
(300 to 400) °C		0.68 °C			
(400 to 630) °C		0.076 °C			
(630 to 800) °C		0.091 °C			
Pt 3926 (100 Ω) (-200 to 0) °C		0.038 °C			
(0 to 100) °C		0.053 °C			
(100 to 300) °C		0.068 °C			
(300 to 400) °C		0.076 °C			
(400 to 630) °C		0.091 °C			
Pt 3916 (100 Ω) (-200 to -190) °C		0.19 °C			
(-190 to -80) °C		0.03 °C			
(-80 to 0) °C		0.038 °C			
(0 to 100) °C		0.046 °C			
(100 to 260) °C		0.053 °C			
(260 to 300) °C		0.061 °C			
(300 to 400) °C		0.068 °C			
(400 to 600) °C		0.076 °C			
(600 to 630) °C		0.18 °C			



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Electrical Simulation of RTD Indicators ^{1,3}	Pt 385 (200 Ω)		Fluke 5500A SC600 Multiproduct Calibrator
	(-200 to 100) °C	0.03 °C	
	(100 to 260) °C	0.038 °C	
	(260 to 300) °C	0.091 °C	
	(300 to 400) °C	0.099 °C	
	(400 to 600) °C	0.11 °C	
	(600 to 630) °C	0.12 °C	
	Pt 385 (500 Ω)		
	(-200 to -80) °C	0.03 °C	
	(-80 to 100) °C	0.038 °C	
	(100 to 260) °C	0.046 °C	
	(260 to 400) °C	0.061 °C	
	(400 to 600) °C	0.068 °C	
	(600 to 630) °C	0.084 °C	
	Pt 385 (1 000 Ω)		
	(-200 to 0) °C	0.023 °C	
(0 to 100) °C	0.023 °C		
(100 to 260) °C	0.03 °C		
(260 to 300) °C	0.038 °C		
(300 to 600) °C	0.046 °C		
(600 to 630) °C	0.053 °C		
Ni 120 (120 Ω)			
(-80 to 100) °C	0.061 °C		
(100 to 260) °C	0.11 °C		
Cu 427 (10 Ω)			
(-100 to 260) °C	0.23 °C		
Oscilloscopes ^{1,3} Amplitude DC Signal into 50 Ω load	± (1 to 25) mV	1.9 mV/V + 30 μV	Fluke 5500A SC600 Multiproduct Calibrator
	± (25 to 110) mV	1.9 mV/V + 31 μV	
	± 110 mV to ± 2.2 V	1.9 mV/V + 44 μV	
	± (2.2 to 25) V	1.9 mV/V + 131 μV	
	into 1M Ω load	(-130 to 130) V	
Amplitude Squarewave 50 Ω load	±1 mV to ±6.6 V p-p 10 Hz to 1 kHz	1.9 mV/V + 25 μV	
1MΩ load	±1 mV to ±130 V p-p 10 Hz to 1 kHz (1 to 10) kHz	761 μV/V + 592 μV 1.9 mV/V + 376 μV	



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Oscilloscopes ^{1,3}			
Rise Time	< 300 ps	+0 ps/-100 ps	Fluke 5500A SC600 Multiproduct Calibrator
Leveled Sine Wave Relative to 50 kHz [5 mV to 5.5 V] p-p	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	11mV/V + 755 μV 15 mV/V + 739 μV 30mV/V + 680 μV	
Time Marker into 50 Ω Load-Source	5 s to 50 ms 20 ms to 2 ns	(25 + 1 000 t) μs/s 2.5 μs	
Rise Time 50 Ω Load Range (p-p)	≤350 ps 5 mV to 2.5 V	(0/-100) ps 15 mV/V + 154 μV	
Wave Generator - Source Amplitude (square, sine, & triangle wave) (10 Hz to 10 kHz) into 1 MΩ into 50 Ω	1.8 mV to 55 V p-p 1.8 mV to 2.5 V p-p	23 mV/V + 76 μV 23 mV/V + 76 μV	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Angle Plates	Up to 6 in	63 μin	Cylindrical Square, Granite Cube, Mu-Checker, Surface Plate
Angle Blocks	(0 to 99) °	5 sec	Rotary Table, Autocollimator, Reflecting Cube
Caliper Checker ²	Up to 8 in	(57 + 2L) μin	Mu-Checker, Height Master, Surface Plate



Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Calipers ¹ Length Depth Inside Diameter	Up to 8 in (8 to 12) in (12 to 20) in (20 to 40) in (40 to 72) in 1 in only 1.617 67 in only	294 μin 289 μin 299 μin 594 μin 647 μin 285 μin 290 μin	Caliper Checker, Gage Blocks
Chamfer Gauges ¹	Up to 2 in	639 μin	Ring Gauges
Depth Micrometers ^{1,2}	Up to 12 in	(53 + 2L) μin	Gage Blocks and Surface Plate
Dial Caliper Gages ²	Up to 6 in	(244 + 32L) μin	P&W Supermicrometer, Ring Gauges
Feeler Gages ¹	Up to 0.01 in	35 μin	P&W Supermicrometer, Gage Blocks, Micrometer
Gage Blocks ²	Up to 0.05 in (0.05 to 0.7) in (0.7 to 1) in (1 to 4) in	4.6 μin 3.4 μin 3.5 μin (2.6 + 0.9L) μin	Gage Block Comparator and Grade 1 Gage Blocks
	Up to 15.0 mm (15.0 to 100.0) mm	(0.118 + 0.000 1L) μm (0.082 + 0.001 4L) μm	
	(4 to 20) in	2L μin	Mu-Checker and Grade 1 Gage Blocks
Height Gages ^{1,2}	Up to 24 in	(297 + 0.8L) μin	Gage Blocks, Surface Plate, Test Indicator
Height Master ²	Up to 18 in	(38.2 + 1.6L) μin	Mu-checker, Surface Plate, Gage Blocks
Indicators ^{1,2} Drop and Test	Up to 4 in (4 to 10) in	(43 + 13L) μin (255 + 10.6L) μin	Micrometer Head, Gage Blocks Surface Plate P&W Supermicrometer
Inside Micrometers ²	Up to 4 in (4 to 24) in	70.8 μin (69 + 3.2L) μin	P&W Lab Master, Gage Blocks, Riser Block, Sine Plate, Height Master



Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Levels	All	1.2 sec	Autocollimator, Reflective Cube, Rotary Table
Outside Micrometers ^{1,2}	Up to 3 in (3 to 20) in	34 μin (52 + 1.9L) μin	Gage Blocks
Micrometer Heads ¹	Up to 2 in	18 μin	Mu-Checker and Gage Blocks
Mu Checkers ¹	Up to 150 μin	3.9 μin	Gage Blocks
Optical Comparator ^{1,2}			
Linear Measurement X-axis and Y-axis	Up to 6 in (6 to 30) in	(60 + 0.6L) μin (13 + 8.3L) μin	Microrule, Gage Blocks, Glass Scale,
Angular Measurement Magnification	(0 to 360) ° 10 X 20 X 31.25 X	34 s 10.821 μin 10.882 μin 10.999 μin	Angle Blocks Magnification Checker, Steel Rule
Plugs Cylindrical ² Pin Gage	Up to 6 in	(2.5 + 4.1L) μin	P&W Lab Master, Gage Blocks
Protractors, Digital	(0 to 90) °	22 sec	Rotary Table, Level
Protractors, Bevel Angle Blade Parallelism	(0 to 35) ° Up to 0.001 in	0.025 ° 34 μin	Angle Blocks, Mu-Checker, Surface Plate
Threaded Plugs ²			
Pitch Diameter	Up to 6 in	(133 + 0.2L) μin	Gage Blocks, Thread Wires, P&W Supermic,
Major Diameter	Up to 6 in	(10 + 1.5L) μin	Gage Blocks,
Angle	Up to 60 °	80 s	Optical Comparator



Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Threaded Ring Gages Pitch Diameter Minor Diameter	Up to 4 in Up to 4 in	304 μin 140 μin	Setting Plug Gages, Optical Comparator, Pin Gages
Radius Gauge	Up to 1 in	0.000 6 in	Optical Comparator, Radius Screen
Ring Gauge – Plain ²	(0.25 to 1) in (1 to 11) in	(17.5 + 3L) μin 4.1L μin	Gage Blocks, Ring Comparator, P&W Lab Master
Rotary Tables ¹ Angle Flatness/Parallelism Compound Angle	360 ° Up to 0.1 in (15, 30, 45) °	1.4 s 35 μin 2.5 s	Autocollimator, Reflecting Cube, Mu Checker, Surface Plate, Angle Blocks
Sine Plates Angle	(15, 30, 45) ° (5in and 10in Roller Spacing only)	4.6 s	Angle Blocks, Gauge Blocks, Mu Checker, Surface Plate
Flatness & Parallelism	Up to 0.001 in	35 μin	Mu Checker, Surface Plate
Steel Rules ²	Up to 78 in	(131 + 37L) μin	Optical Comparator
Surface Plates ^{1,2} Overall Flatness Repeat reading	Up to (72 x 144) in	(15 + 3.2D) μin 20 μin	Mu Checker or Autocollimator



Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Thread Wires	(4 to 120) TPI	28.6 μ m	Plug Gages, P&W Lab Master, Gage Blocks
Tri Mics ¹	Up to 3 in	88 μ m	Ring Gages
V Anvil Micrometers ¹	Up to 1 in	84 μ m	Plain Plug Gages
Vee Block Parallelism to Adjacent Side	Up to 0.001 in	67 μ m	Plug Gauge, Mu Checker, Surface Plate
Parallelism to Opposite Side	Up to 0.001 in	36 μ m	Angle Block, Mu Checker, Surface Plate
Side Squareness	Up to 0.001 in	63 μ m	Granite Cube, Mu Checker, Surface Plate
Surface Flatness & Parallelism	Up to 0.001 in	34 μ m	Mu Checker, Surface Plate

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Velometers and Anemometers	(50 to 200) fpm (200 to 1 200) fpm	1.3 % reading + 5.7 fpm 1.5 % reading + 1 fpm	Standard Anemometer
Balances and Scales ^{1,2}	Up to 210 g	0.18 mg	Class 1 Weights
	(210 to 2 000) g	7.5 mg	Class 4 Weights
	(2 to 31) kg Up to 300 lb (300 to 400) lb (400 to 2 000) lb	59 mg (0.01 + 0.56R) lb (0.02 + 0.56R) lb (0.06 + 1.1R) lb	Class 6 Weights
Barometers	(28 to 32) in Hg	0.09 in Hg	Manometer and Barometer
Durometer Force Type A, B, E, & O Types C, D, & DO Type OO & OOO	(0 to 821) grf (0 to 4 532) grf (0 to 114) grf	0.14 grf	Class 4 Weights, Analytical Balance



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Durometer Indenter Length	(0.09 to 0.11) in	133 μin	Optical Comparator
Dynamometer ^{1,2}	Up to 5 000 g	(0.02 + 0.56R) g	Class 1 & S Weights
	(11 to 400) lb	(0.02 + 0.56R) lb	Class 6 Weights Load Cell, Multimeter
	(400 to 1 000) lb	(0.64 + 0.43R) lb	
	(1 000 to 10 000) lb	(3.91 to 0.28R) lb	
Flow Meters ¹	Up to 2 L/min (2 to 20) L/min	(0.9% + 0.003) L/min (0.7% + 0.044) L/min	Alicat Flow Controller
Rockwell Hardness Testers ¹	HRA HRBW HRC HRD HRE HRF	1.2 HRA 1.2 HRBW 0.7 HRC 1.2 HRD 1.3 HRE 1.3 HRF	Indirect verification per ASTM E18 using Test Blocks
Brinell Hardness Testers ¹	229 HBW 323 HBW	3.3 HBW 5.5 HBW	Indirect verification per ASTM E10 using Test Blocks
Force ^{1,2}	Up to 210 g	0.64 mg	Class 1 Weights
	Up to 400 lb	0.03%	Class 6 Weights, Load Cell, Multimeter
	(400 to 1 000) lb	(0.03 % + 0.3) lb	
	(1 000 to 5 000) lb (5 000 to 10 000) lb	(0.03 % + 0.9) lb (0.03 % + 2.7) lb	
Mass / Weights ²	Up to 2 g	(0.67 % + 0.01) mg	Sartorius MC 210 S, Class 1 & 4 Weights
Mass / Weights ²	(2 to 200) g	(0.07 % + 0.03) mg	Sartorius MC 210-03S, Class 1 & 4 Weights
	(200 to 2 000) g	0.34 % mg	Sartorius MSA31 Scale, Class 1 & 4 Weights
	(2 000 to 31 000) g	79 mg	GP-30K Scale, Class 1 & 4 Weights
Pipettes ^{1,2}	(0.5 to 10 000) μL	(0.04 % + 0.03) μL	Precision Balances, Distilled Water
Volumetric Ware ^{1,2}	Up to 2 000 mL	(0.04 %) as mL	Precision Balances, Distilled Water



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Pressure Gages and Transducers ^{1,2}	Up to 0.5 in H ₂ O	(0.000 3 + 0.55R) in H ₂ O	Manometer
	(0.072 to 7.5) psi	(0.009 % + 0.47R) psi	Mensor 2400 Pressure Gage
	(7.5 to 60) psi	(0.018 % + 0.54R) psi	Dead Weight Tester
	(60 to 1 000) psi	(0.045 % + 0.47R) psi	Dead Weight Tester
	(1 000 to 10 000) psi	(0.057 % + 0.22R) psi	Dead Weight Tester
Vacuum Gages ¹	(0 to 30) in Hg	0.09 in Hg	Manometer
Torque Transducers ^{1,2}	Up to 27.6 lbf·in (27.6 to 150) lbf·in 150 lbf·in to 60 lbf·ft (60 to 2 000) lbf·ft	(0.007 % + 0.0035) lbf·in (0.059 % + 0.000 04) lbf·in 0.3 % + 0.009) lbf·ft (0.079 % + 0.000 5) lbf·ft	Torque Arms and Class 6 Weights
Torque Tools ^{1,2}	(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 (200 to 2 000) lbf·ft	(0.17 % + 0.11) lbf·in (0.41 % + 0.05) lbf·in (0.42 % + 0.02) lbf·in (0.39 % + 0.07) lbf·ft (0.29 % + 0.01) lbf·ft (0.29 %) lbf·ft	CDI Torque Machine

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Humidity ¹	(10 to 90) %RH (90 to 95) %RH	1.3 %RH 2.1 %RH	Vaisala HMI70 Humidity Indicator, Salts
Temperature – Measure ¹	(-20 to 60) °C	0.25 °C	Vaisala HMI41 Humidity Indicator
	(-270 to -210) °C	0.7 °C	Datalogger, Thermocouple
	(-210 to 400) °C	0.62 °C	
	(400 to 1 370) °C	1.3 °C	
	(-270 to 400) °C (400 to 1 370) °C	0.57 °C 1.26 °C	Fluke 5500A Multiproduct Calibrator, HP 3458A Opt 002 Multimeter



Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Temperature – Measure ¹	(-200 to 100) °C (100 to 300) °C (300 to 500) °C (500 to 660) °C	0.046 °C 0.065 °C 0.085 °C 0.12 °C	PRT 5628, HP 3458A Opt 002 Multimeter
Temperature – Source ¹	(-270 to 400) °C (400 to 1 370) °C	0.57 °C 1.3 °C	Fluke 5500A Multiproduct Calibrator, HP 3458A Opt 002, Multimeter, Dry Well
	(-25 to 100) °C (100 to 300) °C (300 to 400) °C	0.046 °C 0.065 °C 0.085 °C	PRT 5628, HP 3458A Opt 002 Multimeter, Dry Well
Thermocouple Wires and Probes ¹	(-25 to 400) °C	0.07 °C	Fluke 5500A Multiproduct Calibrator, HP 3458A Opt 002 Multimeter
Infrared Thermometers ¹	(-20 to 660) °C	0.31 °C	PRT 5628, Keithley 2100 Multimeter
	(23 to 400) °C	(0.6 % + 1.1) °C	Ametek ETC-400R $\epsilon = 0.96, \lambda = (8-14) \mu\text{m}$

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Frequency – Source ¹	1 μHz to 50 kHz 50 kHz to 600 MHz	5 μHz/Hz 2.5 μHz/Hz	HP 3325B Function Generator, Fluke 5500A SC 600 Multiproduct Calibrator
Frequency – Measure ¹	(1 to 40) Hz 40 Hz to 10 kHz 10 kHz to 1 MHz (1 to 20) MHz (20 to 100) MHz	500 μHz/Hz 100 μHz/Hz 3.6 μHz/Hz + 1 Hz 0.4 Hz 2.4 Hz	HP 3458A Opt 002 Multimeter, HP 5334A Counter
Stopwatches and Timers ¹	Up to 24 h	0.12 s	Time Signal Receiver
Rate of Pull ^{1,2} (Tensile Testers)	Up to 24 in/min	(0.14 % + 0.013) in/min	Steel Rule, Stopwatch



Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
RPM Devices ^{1,2}	Up to 30 000 rpm	(0.041 % + 0.6) rpm	Tachometer
Tachometers ^{1,2}	(20 to 300) rpm (300 to 3 000) rpm (3 000 to 30 000) rpm	(0.009 % + 0.026) rpm (0.011 % + 0.14) rpm (0.011 % + 1.3) rpm	Ametek 1965 Digistrobe

Testing

Dimensional Measurement

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Length ^{1,2}	Up to 13 in	(1.9 + 4.2L) μin	P&W Lab Master
	(0 to 1) in x (3 to 4) in	76 μin	Micrometer Set
	Up to (4 x 2) in	(133 + 1L) μin	Optical Comparator
	Up to 18 in	(60 + 2.6L) μin	Height Master, Mu Checker, Surface Plate
	Up to 24 in	(32 + 2.3L) μin	Gage Blocks, Mu Checker, Surface Plate
	Up to 1 200 in (100 ft)	(0.007 3 + 0.000 18L) in	Steel Rule
Depth ¹	(0 to 1) in	150 μin	Drop Indicator
Flatness & Parallelism ¹	Up to 0.001 in	35 μin	Mu Checker, Surface Plate
Go - No Go Measurement ²	Up to 1 in	(118 + 8L) μin	Pin Gages
Squareness	Up to (8 x 8) in	56 μin	Granite Cube, Mu Checker, Surface Plate
Angle	(0 to 360) °	0.025 s	Optical Comparator
Radius	Up to 1 in	257 μin	

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:



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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*” represents Length in inches, “*D*” refers to Diagonal length in inches, “*R*” represents the Resolution of the unit under test and “%” signifies percent of applied value.
3. Uncertainties for Electromagnetic - DC/Low Frequency do not include possible contributions to uncertainty from a “best available” unit under test.
4. This scope is formatted as part of a single document including Certificate of Accreditation No. ACT-1201.



Vice President