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
Santa Barbara, 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 AND
ANSI/NCSL Z540.3-2006

while demonstrating technical competence in the field of

CALIBRATION & 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: 06/03/2016-07/11/2018
Version No. 003 Issued: 06/03/2016

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 January 2009).

ANSI-ASQ National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

Brylen Technologies, Inc.

275 Orange Avenue #A Goleta, CA 93117
Barbara Tzur Phone: 805-692-9300
barbara.tzur@brylen.com www.brylen.com

CALIBRATION AND TESTING

Valid to: July 11, 2018 Certificate Number: ACT-1201

I. Electromagnetic - DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
DC Voltage - Source	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 µV/V + 2.4 µV 27 µV/V + 50 µV 27 µV/V + 50 µV 31 µV/V + 4.9 mV 41 µV/V + 2.5 mV	Fluke 5500A SC600
DC Voltage - Measure	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	7.8 µV/V + 350 nV 6.8 µV/V + 350 nV 6.8 µV/V + 650 nV 9 µV/V + 40 µV 8.8 µV/V + 1.1 mV	HP 3458A Opt 002
DC Current - Source	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 µA/A + 68 nA 68 µA/A + 496 nA 69 µA/A + 5.3 µA 225 µA/A + 109 µA 447 µA/A + 625 µA	Fluke 5500A SC600
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	39 µA/A + 46 pA 30 µA/A + 46 pA 27 µA/A + 130 pA 28 µA/A + 91 pA 28 µA/A + 5.7 nA 28 µA/A + 57 nA 45 µA/A + 570 nA 130 µA/A + 11 µA	HP 3458A Opt 002

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
AC Voltage – Source	**Up 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 **330 mV to 3.3 V** (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz **(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 **330 V to 1.02 kV** 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 2.6 mV/V + 16 µV 1.1 mV/V + 16 µV 1.5 mV/V + 16 µV 1.9 mV/V + 16 µV 2.7 mV/V + 26 µV 4.6 mV/V + 46 µV 1.9 mV/V + 38 µV 379 µV/V + 16 µV 760 µV/V + 16 µV 1.2 mV/V + 31 µV 1.8 mV/V + 129 µV 5.3 mV/V + 251 µV 1.1 mV/V + 196 µV 224 µV/V + 60 µV 607 µV/V + 53 µV 1.1 mV/V + 232 µV 1.8 mV/V + 1.3 mV 3.8 mV/V + 2.5 mV 1.1 mV/V + 1.9 mV 300 µV/V + 645 µV 6.1 µV/V + 2.1 mV 1.4 mV/V + 3.8 mV 1.8 mV/V + 13 mV 380 µV/V + 6.1 mV 610 µV/V + 12 µV 680 µV/V + 26 µV 380 µV/V + 61 mV 1.5 mV/V + 76 mV 1.5 mV/V + 380 mV	Fluke 5500A SC600

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
AC Voltage - Measure	**Up to 10 mV** (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 4) MHz (4 to 8) MHz **(10 to 100 mV)** (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 4) MHz (4 to 8) MHz (8 to 10) MHz **100 mV to 1 V** (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 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 300 kHz to 1 MHz (1 to 4) MHz (4 to 8) MHz (8 to 10) MHz	340 µV/V + 2 µV 229 µV/V + 226 nV 342 µV/V + 1 µV 1.1 mV/V + 1 µV 5.7 mV/V + 1 µV 45 mV/V + 2 µV 14 mV/V + 6 µV 73 mV/V + 8 µV 226 mV/V + 9 µV 82 µV/V + 4.5 µV 82 µV/V + 2.3 µV 161 µV/V + 2.3 µV 342 µV/V + 2.3 µV 910 µV/V + 2.3 µV 342 µV/V + 11 µV 11 mV/V + 11 µV 45 mV/V + 79 µV 45 mV/V + 91 µV 170 mV/V + 113 µV 82 µV/V + 45 µV 82 µV/V + 23 µV 160 µV/V + 23 µV 342 µV/V + 23 µV 908 µV/V + 23 µV 342 µV/V + 113 µV 11 mV/V + 113 µV 46 mV/V + 792 µV 45 mV/V + 905 µV 170 mV/V + 1.1 mV 82 µV/V + 453 µV 82 µV/V + 226 µV 161 µV/V + 226 µV 342 µV/V + 226 µV 908 µV/V + 226 µV 342 µV/V + 1.1 mV 11 mV/V + 1.1 mV 45 mV/V + 7.9 mV 45 mV/V + 9.1 mV 107 mV/V + 11 mV	HP 3458A Opt 002

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
AC Voltage - Measure (cont.)	**(10 to 100) V**		HP348A Opt 002
	(1 to 40) Hz	229 µV/V + 4.5 mV	
	40 Hz to 1 kHz	229 µV/V + 2.3 mV	
	(1 to 20) kHz	229 µV/V + 2.3 mV	
	(20 to 50) kHz	398 µV/V + 2.3 mV	
	(50 to 100) kHz	1.4 mV/V + 2.3 mV	
	(100 to 300) kHz	4.5 mV/V + 11 mV	
	300 kHz to 1 MHz	17 mV/V + 11 mV	
	100 to 1 kV		
	(1 to 40) Hz	455 µV/V + 45 mV	
	40 Hz to 1 kHz	455 µV/V + 23 mV	
	(1 to 20) kHz	681 µV/V + 23 mV	
	(20 to 50) kHz	1.4 mV/V + 23 mV	
	(50 to 100) kHz	3.4 mV/V + 23 mV	
AC Current - Source	**(30 to 330) µA**		Fluke 5500A SC600
	(10 to 20) Hz	1.9 mA/A + 126 nA	
	(20 to 45) Hz	922 µA/A + 127 nA	
	45 Hz to 1 kHz	935 µA/A + 198 nA	
	(1 to 5) kHz	3.0 mA/A + 126 nA	
	(5 to 10) kHz	9.5 mA/A + 122 nA	
	330 µA to 3.3 mA		
	(10 to 20) Hz	1.5 mA/A + 230 nA	
	(20 to 45) Hz	760 µA/A + 230 nA	
	45 Hz to 1 kHz	760 µA/A + 230 nA	
	(1 to 5) kHz	1.5 mA/A + 230 nA	
	(5 to 10) kHz	4.6 mA/A + 230 nA	
	(3.3 to 33) mA		
	(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	

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
AC Current - Measure	**(5 to 100) µA**		HP 3458A Opt 002
	(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 + 8.0 µA	
	(1 to 10) mA		
	(10 to 20) Hz	4.5 mA/A + 2.3 µA	
	(20 to 45) Hz	1.7mA/A + 2.3 µA	
	(45 to 100) Hz	684 µA /A + 2.3 µA	
	100 Hz to 5 kHz	334 µA /A + 2.5 µA	
	(5 to 20) kHz	684 µA /A + 2.3 µA	
	(20 to 50) kHz	4.5 mA/A + 4.5 µA	
	(50 to 100) kHz	6.3 mA/A + 80 µA	
	(10 to 100) mA		
	(10 to 20) Hz	4.5 mA/A + 23 µA	
	(20 to 45) Hz	1.7 mA/A + 23 µA	
	(45 to 100) Hz	685 µA/A + 23 µA	
	100 Hz to 5 kHz	334 µA/A + 25 µA	
	(5 to 20) kHz	684 µA/A + 2.3 µA	
	(20 to 50) kHz	4.5 mA/A + 45 µA	
	(50 to 100) kHz	6.2 mA/A + 170 µA	
	100 mA to 1 A		
	(10 to 20) Hz	4.5 mA/A + 226 µA	
	(20 to 45) Hz	1.8 mA/A + 226 µA	
	(45 to 100) Hz	910 µA/A + 226 µA	
	100 Hz to 5 kHz	112 µA/A + 247 µA	
	(5 to 20) kHz	3.4 mA/A + 223 µA	
	(20 to 50) kHz	11 mA/A + 453 µA	

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Resistance - Source	Up to 11 Ω	69 μΩ/Ω + 8 mΩ	Fluke 5500A SC600
	(11 to 33) Ω	84 μΩ/Ω + 13 mΩ	
	(33 to 110) Ω	64 uΩ/Ω + 13 mΩ	
	(110 to 330) Ω	67 μΩ/Ω + 12 mΩ	
	330 Ω to 1.1 kΩ	58 μΩ/Ω + 70 mΩ	
	(1.1 to 3.3) kΩ	65 μΩ/Ω + 63 mΩ	
	(3.3 to 11) kΩ	58 μΩ/Ω + 698 mΩ	
	(11 to 33) kΩ	65 μΩ/Ω + 620 mΩ	
	(33 to 110) kΩ	80 μΩ/Ω + 6.8 Ω	
	(110 to 330) kΩ	81 μΩ/Ω + 6.0 Ω	
	330 kΩ to 1.1 MΩ	102 μΩ/Ω + 64 Ω	
	(1.1 to 3.3) MΩ	50 μΩ/Ω + 538 Ω	
	(3.3 to 11) MΩ	420 μΩ/Ω + 960 Ω	
	(11 to 33) MΩ	702 μΩ/Ω + 3.0 kΩ	
	(33 to 110) MΩ	3.8 mΩ/Ω + 5.3 kΩ	
	(110 to 330) MΩ	3.8 mΩ/Ω + 12.6 kΩ	
Fixed Values	500 μΩ	5.7 μΩ	Simpson Current Shunts
	2 mΩ	23 μΩ	
	5 mΩ	57 μΩ	
	10 mΩ	113 μΩ	
Resistance – Measure	Up to 10 Ω	18 μΩ/Ω + 79 μΩ	HP 3458A Opt 002
	(10 to 100) Ω	17 μΩ/Ω + 580 μΩ	
	100 Ω to 1 kΩ	15 μΩ/Ω + 680 μΩ	
	(1 to 10) kΩ	15 μΩ/Ω + 2.1 mΩ	
	(10 to 100) kΩ	15 μΩ/Ω + 30 mΩ	
	100 k Ω to 1 MΩ	20 μΩ/Ω + 2.4 Ω	
	(1 to 10) MΩ	59 μΩ/Ω + 130 Ω	
	(10 to 100) MΩ	600 μΩ/Ω + 1.6 kΩ	
	100 M Ω to 1 GΩ	5.6 mΩ/Ω + 54 kΩ	

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Capacitance - Source			
10Hz to 10kHz	(330 to 500) pF	3.8 mF/F + 7.6 pF	
10Hz to 3kHz	500 pF to 1.1 nF	3.8 mF/F + 7.6 pF	
10Hz to 1kHz	(1.1 to 3.3) nF	3.8 mF/F + 7.6 pF	
(10 to 600) Hz	(3.3 to 11) nF	3.8 mF/F + 8.6 pF	
(10 to 300) Hz	(11 to 33) nF	1.9 mF/F + 76 pF	
(10 to 150) Hz	(33 to 110) nF	1.8 mF/F + 90 pF	
(10 to 120) Hz	(110 to 330) nF	1.9 mF/F + 230 pF	Fluke 5500A SC600
(10 to 80) Hz	330 nF to 1.1 µF	1.9 mF/F + 820 pF	
(0 to 50) Hz	(1.1 to 3.3) µF	2.7 mF/F + 2.3 nF	
(0 to 20) Hz	(3.3 to 11) µF	2.6 mF/F + 8.8 nF	
(0 to 6) Hz	(11 to 33) µF	3.0 mF/F + 23 nF	
(0 to 2) Hz	(33 to 110) µF	3.8 mF/F + 86 nF	
(0 to 0.6) Hz	(110 to 330) µF	5.3 mF/F + 230 nF	
(0 to 0.2) Hz	330 µF to 1.1 mF	7.3 mF/F + 310 nF	
Inductance-Source	0 to 999.999 mH	23 mH/H + 90 nH	IET LC-400L-SC
Electrical Simulation of Thermocouple Indicators			
Type B	(600-800) ˚C	0.33 ˚C	
	(800 to 1 000) ˚C	0.26 ˚C	
	(1 000 to 1 550) ˚C	0.23 ˚C	
	(1 550 to 1 820) ˚C	0.25 ˚C	
Type C	(0 to 15) ˚C	0.23 ˚C	
	(150 to 650) ˚C	0.20 ˚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	Fluke 5500A SC600
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	

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Electrical Simulation of Thermocouple Indicators (cont.)			
Type J	(-210 to -100) ˚C (-100 to -30) ˚C (-30 to 150) ˚C (150 to 760) ˚C (760 to 1 200) ˚C	0.21 ˚C 0.12 ˚C 0.11 ˚C 0.13 ˚C 0.18 ˚C	
Type K	(200 to -100) ˚C (-100 to -25) ˚C (-25 to 120) ˚C (120 to 1 000 ˚C (1 000 to 1 372) ˚C	0.25 ˚C 0.14 ˚C 0.12 ˚C 0.20 ˚C 0.30˚C	
Type L	(200 to -100) ˚C (-100 to 800) ˚C (800 to 900) ˚C	0.28 ˚C 0.20 ˚C 0.13 ˚C	
Type N	(-200 to -100) ˚C (-100 to -25) ˚C (-25 to 120) ˚C (120 to 410) ˚C (410 to 1 300) ˚C	0.30˚C 0.17 ˚C 0.15 ˚C 0.14 ˚C 0.21 ˚C	Fluke 5500A SC600
Type R	(0 to 250) ˚C (250 to 400) ˚C (400 to 1 000) ˚C (1 000 to 1 767) ˚C	0.43 ˚C 0.27 ˚C 0.25 ˚C 0.30˚C	
Type S	(0 to 250) ˚C (250 to 1 000) ˚C (1 000 to 1 400) ˚C (1 400 to 1 767) ˚C	0.36 ˚C 0.27 ˚C 0.28 ˚C 0.35 ˚C	
Type T	(-250 to -150) ˚C (-150 to 0) ˚C (0 to 120) ˚C (120 to 400) ˚C	0.48 ˚C 0.18 ˚C 0.12 ˚C 0.11 ˚C	
Type U	(-200 to 0) ˚C (0 to 600) ˚C	0.43 ˚C 0.21 ˚C	

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Electrical Simulation of RTDs			
Pt 395 (100 Ω)	(-200 to 0) ˚C	0.038 ˚C	
	(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	0.030 ˚C	
	(-80 to 0) ˚C	0.038 ˚C	
	(0 to 100) ˚C	0.046 ˚C	Fluke 5500A SC600
	(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	
Pt 385 (200 Ω)	(-200 to 100) ˚C	0.030 ˚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	0.030 ˚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	

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Electrical Simulation of RTDs (cont.)			
Pt 385 (1 000 Ω)	(-200 to 0)˚C	0.023 ˚C	
	(0 to 100) ˚C	0.023 ˚C	
	(100 to 260) ˚C	0.030 ˚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			
Amplitude DC Signal into 50 Ω load	± (1 to 25) mV	1.9 mV/V + 30 µV	
	± (25 to 110) mV	1.9 mV/V + 31 µV	
	± 110 mV to ± 2.2 V	1.9 mV/V + 44 µV	
	± (2.2 25) V	1.9 mV/V + 131 µV	
into 1M Ω load	(-130 to 130) V	380 µV/V + 30 µV	
Amplitude Squarewave 50 Ω load	±1 mV to ±6.6 V p-p 10 Hz to 1 kHz	1.9 mV/V + 25 µV	Fluke 5500A SC600
1MΩ load	±1 mV to ±130 V p-p		
	10 Hz to 1 kHz	761 µV/V + 592 µV	
	(1 to 10) kHz	1.9 mV/V + 376 µV	
Rise Time	< 300 ps	+0 ps/-100 ps	
Leveled Sine Wave Relative to 50 kHz [5 mV to 5.5 V] p-p	50 kHz to 100 MHz	11mV/V + 755 µV	
	(100 to 300) MHz	15 mV/V + 739 µV	
	(300 to 600) MHz	30mV/V + 680 µV	
Time Marker into 50 Ω Load-Source	5 s to 50 ms	(25 + 1 000 t) µs/s	
	20 ms to 2 ns	2.5 µs	
Rise Time 50 Ω Load	≤350 ps	(0/-100) ps	
Range (p-p)	5 mV to 2.5 V	15 mV/V + 154 µV	
Wave Generator - Source Amplitude (10 Hz to 10 kHz) square, sine, triangle into 1 MΩ	1.8 mV to 55 V p-p	23 mV/V + 76 µV	
square, sine, triangle into 50 Ω	1.8 mV to 2.5 V p-p	23 mV/V + 76 µV	

II. Time & Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Frequency – Source	1 µHz to 50 kHz 50 kHz to 600 MHz	5 µHz/Hz 2.5 µHz/Hz	HP 3325B Fluke 5500A SC 600
Frequency – Measure	(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 HP 5334A
Stopwatches and Timers	Up to 24 h	0.12 s	Time Signal Receiver

III. Thermodynamic

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Humidity	(10 to 90) %RH (90 to 95) %RH	1.3 %RH 2.1 %RH	Vaisala HMI70, Salts
Temperature - Measure	(-20 to 60) ˚C (-270 to -210) ˚C (-210 to 400) ˚C (400 to 1 370) ˚C (-270 to 400) ˚C (400 to 1 370) ˚C (-200 to 100) ˚C (100 to 300) ˚C (300 to 500) ˚C (500 to 660) ˚C	0.25 ˚C 0.7 ˚C 0.62 ˚C 1.32 ˚C 0.57 ˚C 1.26 ˚C 0.046 ˚C 0.065 ˚C 0.085 ˚C 0.12 ˚C	Vaisala HMI41 Datalogger, Thermocouple Fluke 5500A, HP 3458A Opt 002 PRT 5628, HP 3458A Opt 002
Temperature - Source	(-270 to 400) ˚C (400 to 1 370) ˚C (-25 to 100) ˚C (100 to 300) ˚C (300 to 400) ˚C	0.57 ˚C 1.26 ˚C 0.046 ˚C 0.065 ˚C 0.085 ˚C	Fluke 5500A, HP 3458A Opt 002, Dry Well PRT 5628, HP 3458A Opt 002, Dry Well
Thermocouple Wires and Probes	(-25 to 400) ˚C	0.07 ˚C	Fluke 5500A, HP 3458A Opt 002
Infrared Thermometers	(-20 to 660) ˚C (23 to 400) ˚C	0.31 ˚C (0.6% + 1.1) ˚C	PRT 5628, Keithley 2100 Ametek ETC-400R

IV. Mechanical

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Velometers and Anemometers*	(50 to 200) fpm (200 to 1 200) fpm	1.3 % reading + 5.7 fpm 1.5 % reading + 1.0 fpm	Standard Anemometer
Balances and Scales	Up to 210 g (210 to 2 000) g (2 to 31) kg Up to 300 lb (300 to 400) lb (400 to 2 000) lb	0.18 mg 7.5 mg 59 mg (0.01 + 0.56R) lb (0.02 + 0.56R) lb (0.06 + 1.1R) lb	Class 1 Weights Class 4 Weights Class 6 Weights
Barometers*	(28 to 32) in Hg	0.09 in Hg	Manometer and Barometer
Durometers*	Up to 135 duro pt	0.14 g	Class 4 Weights, Analytical Balance, Optical Comparator
Dynamometer	Up to 5 000 g (11 to 400) lb (400 to 1 000) lb (1 000 to 10 000) lb	(0.02 + 0.56R) g (0.02 + 0.56R) lb (0.64 + 0.43R) lb (3.91 to 0.28R) lb	Class 1 & S Weights Class 6 Weights Load Cell, Multimeter
Flow Meters	Up to 2 L/min (2 to 20) L/min	(0.9% + 0.003) L/min (0.7% + 0.044) L/min	Alicat Flow Contoller
Hardness Testers (Indirect Verification)	**Rockwell** HRA HRB HRC HRD HRE HRF **Brinell** 229 323	 1.2 HRA 1.2 HRB 0.7 HRC 1.2 HRD 1.3 HRE 1.3 HRF 3.3 5.5	Test Blocks
Force	Up to 210 g Up to 400 lb (400 to 1 000) lb (1 000 to 5 000) lb (5 000 to 10 000) lb	0.64 mg 0.03% (0.03 % + 0.3) lb (0.03 % + 0.9) lb (0.03 % + 2.7) lb	Class 1 Weights Class 6 Weights, Load Cell, Multimeter

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Mass / Weights*	Up to 2 g (2 to 200) g (200 to 2 000) g (2 000 to 31 000) g	(0.67 % + 0.01) mg (0.07 % + 0.03) mg (0.34 %) mg 79 mg	Sartorius MC 210 S Sartorius MSA3103S AND GP-30K Class 1 & 4 Weights
Pipettes	(0.5 to 10 000) µL	(0.04 % + 0.03) µL	Precision Balances, Distilled Water
Volumetric Ware	Up to 2 000 mL	(0.04 %) as mL	Precision Balances, Distilled Water
Position Transducers*	Up to 24 in (24 to 48) in (48 to 72) in	(0.003 x V/L) V (0.006 x V/L) V (0.009 x V/L) V	Height Gage, Keithley 2100 Multimeter
Pressure Gages and Transducers	Up to 0.5 in H_2O (0.072 to 7.5) psi (7.5 to 60) psi (60 to 1 000) psi (1 000 to 10 000) psi	(0.000 3 + 0.55R) in H_2O (0.009 % + 0.47R) psi (0.018 % + 0.54R) psi (0.045 % + 0.47R) psi (0.057 % + 0.22R) psi	Dwyer Pressure Calibrator Series MC b Dead Weight Tester, Mensor 2400, Manometer
Vacuum Gages	(0 to 30) in Hg	0.09 in Hg	Manometer
Rate of Pull (Tensile Testers)	Up to 24 in/min	(0.14 % + 0.013) in/min	Steel Rule, Stopwatch
RPM Devices	Up to 30 000 rpm	(0.041 % + 0.6) rpm	Tachometer
Tachometers	(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 % + 1.32) rpm	Ametek 1965 Digistrobe
Torque Transducers	Up to 27.6 lbf·in 27.6 lbf·in 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%+0.00004) lbf·in 0.3 % + 0.009) lbf·ft (0.079 % + 0.0005) lbf·ft	Torque Arms and Class 6 Weights
Torque Tools	(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

V. Dimensional

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Angle Plates*	Up to 6 in	63 µin	Cylindrical Square, Granite Cube, Mu-Checker, Surface Plate
Angle Blocks*	(0 to 99)º	5 ”	Rotary Table, Autocollimator, Reflecting Cube
Caliper Checker*	Up to 8 in	(57 + 2L) µin	Mu-Checker, Height Master, Surface Plate
Calipers	Up to 8 in (8 to 12) in (12 to 20) in (20 to 40) in (40 to 72) in Depth Inside Diameter	294 µin 289 µin 299 µin 594 µin 647 µin 285 µin 290 µin	Caliper Checker, Gage Blocks
Chamfer Gauges	Up to 2 in	639 µin	Ring Gauges
Depth Micrometers	Up to 12 in	(53 + 2L) µin	Gage Blocks and Surface Plate
Dial Caliper Gages*	Up to 6 in	(244 + 32L) µin	P&W Supermicrometer, Ring Gages
Feeler Gages	Up to 0.01 in	35 µin	P&W Supermicrometer, Gage Blocks, Micrometer
Gage Blocks*	Up to 0.05 in (0.05 to 0.7) in (0.7 to 1) in (1 to 4) in (4 to 20) in (0.5 to 25.0) mm (25.0 to 100.0) mm	4.6 µin 3.4 µin 3.5 µin (2.6 + 0.9L) µin 2.5L µin (0.12 + 0.0003L) µm (0.085 + 0.0015L) µm	Gage Block Comparator or Mu-Checker and Grade 1 Gage Blocks
Height Gages	Up to 24 in	(297 + 0.8L) µin	Gage Blocks, Surface Plate, Test Indicator
Height Master*	Up to 18 in	(38.2 + 1.6L) µin	Mu-checker, Surface Plate, Gage Blocks

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Indicators Drop and Test Coax*	 Up to 4 in (4 to 10) in Up to 0.2 in	 (43 + 13L) µin (255 + 10.6L) µin 36 µin	Micrometer Head, Gage Blocks Surface Plate P&W Supermicrometer
Inside Micrometers*	Up to 12 in (4 to 24) in	(59 + 0.7L) µin (69 + 3.2L) µin	P&W Lab Master, Gage Blocks, Riser Block, Sine Plate, Height Master
Levels*	All	1.1 ”	Autocollimator, Reflective Cube, Rotary Table
Outside Micrometers	Up to 3 in (3 to 20) in	34 µin (52 + 1.9L) µin	Gage Blocks
Micrometer Heads	Up to 2 in	18 µin	Mu-Checker and Gage Blocks
Mu Checkers	Up to 150 µin	3.9 µin	Gage Blocks
Optical Comparator Linear Measurement X-axis and Y-axis Angular Measurement	 Up to 6 in (6 to 30) in 360 º	 (60 + 0.6L) µin (13 + 8.3L) µin 34 ”	 Microrule, Gage Blocks, Glass Scale, Magnification Balls Angle Blocks
Plugs Cylindrical* Pin Gage	Up to 6 in	(2.5 + 4.1L) µin	P&W Lab Master, Gage Blocks
Protractors, Digital* Protractors, Bevel* Angle Blade Parallelism	360 º 360 º Up to 0.001 in	22 ” 1’ 31” 34 µin	Rotary Table, Level Angle Blocks, Mu-Checker, Surface Plate
Threaded Plugs* Pitch Diameter Major Diameter Angle	 Up to 6 in Up to 6 in Up to 60 º	 (133 +0.2L) µin (10 + 1.5L) µin 80 ”	Gage Blocks, Thread Wires, P&W Lab Master, Gage Blocks, Optical Comparator
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

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Radius Gauge*	Up to 1 in	0.0006 in	Optical Comparator, Radius Screen
Ring Gauge – Plain*	(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 Angle Flatness/Parallelism Compound Angle	 360 º Up to 0.1 in (15, 30, 45)°	 1.4 ” 35 µin 2.5 “	Autocollimator, Reflecting Cube, Mu Checker, Surface Plate, Angle Blocks
Sine Plates* Angle Flatness & Parallelism	 (15, 30, 45)° (5, 10) in Roller Spacing Up to 0.001 in	 4.6 ” 35 µin	 Angle Blocks, Gauge Blocks, Mu Checker, Surface Plate Mu Checker, Surface Plate
Steel Rules*	Up to 78 in	(131 + 37L) µin	Optical Comparator
Surface Plates	Up to (72 x 144) in Flatness Repeat reading	(15 + 3.2D) µin 20 µin	Mu Checker or Autocollimator
Thread Wires*	(4 to 120) TPI	28.6 µin	Plug Gages, P&W Lab Master, Gage Blocks
Tri Mics	Up to 3 in	88 µin	Ring Gages
V Anvil Micrometers	Up to 1 in	84 µin	Plain Plug Gages
Vee Block* Parallelism to Adjacent Side Parallelism to Opposite Side Side Squareness Surface Flatness & Parallelism	 Up to 0.001 in Up to 0.001 in Up to 0.001 in Up to 0.001 in	 67 µin 36 µin 63 µin 34 µin	 Plug Gauge, Mu Checker, Surface Plate Angle Block, Mu Checker, Surface Plate Granite Cube, Mu Checker, Surface Plate Mu Checker, Surface Plate

VI. Dimensional Inspection / Measurement

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty(±)]	Reference Standard or Equipment
Length	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 + L) 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)	(0.0073 + 0.00018L) in	Steel Rule
Depth	(0 to 1) in	150 µin	Drop Indicator
Flatness & Parallelism	Up to 0.001 in	35 µin	Mu Checker, Surface Plate
Go - No Go* Measurement	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*	360°	1.3’	Optical Comparator
Radius*	Up to 1 in	257 µin	

Notes:

1. Calibration and Measurement Capabilities (CMC) (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of k=2.
2. This laboratory offers calibration services in its laboratory and on-site at customer-designated locations. 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.
3. Parameters identified with an asterisk (*) are laboratory-only, i.e,, not available for on-site calibration.
4. The use of (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 load.
5. Uncertainties for Electromagnetic - DC/Low Frequency do not include possible contributions to uncertainty from a “best available” unit under test.
6. This scope is formatted as part of a single document including the Certificate of Accreditation No. ACT-1201.