CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Premier Scales & Systems, Inc.
4901 N. St. Joseph Avenue
Evansville, IN 47720
(and satellite location as shown on the scope)

Fulfills the requirements of

ISO/IEC 17025:2017

and national standard

ANSI/NCSL Z540-1-1994 (R2002)

In the field (s) of

CALIBRATION and **DIMENSIONAL MEASUREMENT**

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 17 May 2022
Certificate Number: AC-1222

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. 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 17025:2017 AND ANSI/NCSL Z540-1-1994 (R2002)

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CALIBRATION AND DIMENSIONAL MEASUREMENT

Valid to: **May 17, 2022** Certificate Number: **AC-1222**

CALIBRATION

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Meters	1 kHz 94 dB 114 dB	0.6 dB 0.6 dB	Sound Level Calibrator

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters	4 pH 7 pH 10 pH	0.06 pH 0.04 pH 0.05 pH	pH Buffer Solutions
Conductivity Meters	1 µS/cm 10 µs/cm 100 µS/cm 1 000 µS/cm	0.65 µS/cm 0.56 µs/cm 2.3 µS/cm 6.1 µS/cm	Conductivity Solutions
Viscosity Cups	(34 to 124) cSt	0.43 % of reading + 1 cSt	Viscosity Standards, Stopwatch
Volumetric Dispensers	(1 to 100) mL (1 to 1 000) mL	0.063 mL 0.075 mL	ASTM E 542-01 and OEM validated procedures using Analytical Balance.
Pipettes	(1 to 10) µL (100 to 1 000) µL	0.11 µL 5.0 µL	Analytical Balance, Thermometer
Refractometers [2]	Zero Reading	0.28 + 0.6*R*	Distilled Water

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source [1]	Up to 330 mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (100 to 1 000) V	1.6 µV 16 µV 0.13 mV 1.3 mV 3.1 mV	Multiproduct Calibrator
DC Voltage – Measure [1]	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	2.4 µV 6.4 µV 52 µV 0.67 mV 9.6 mV	Precision Digital Multimeter
DC Current – Source [1]	Up to 330 µA (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	14 nA 0.19 µA 0.48 µA 4.4 µA 77 µA 0.31 mA 1.5 mA 23 mA	Multiproduct Calibrator
DC Current – Source for Clamp-on Current Meters [1]	(20 to 200) A (200 to 500) A (500 to 1 000) A	0.41 A 1.1 A 2.1 A	Multiproduct Calibrator, 50-turn Coil
DC Current – Measure [1]	Up to 100 µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (100 to 400) mA (0.4 to 1) A (1 to 3) A (3 to 10) A	0.018 µA 0.67 µA 1.7 µA 6.7 µA 20 µA 0.27 mA 1.1 mA 3.5 mA	Precision Digital Multimeter
Resistance – Source [1] (Simulation)	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ	0.7 mΩ 1.4 mΩ 1.7 mΩ 3.4 mΩ 9.6 mΩ 38 mΩ 96 mΩ 0.4 Ω 1 Ω	Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source [1] (Simulation)	(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 (0.33 to 1.1) GΩ	3.8 Ω 32 Ω 79 Ω 0.4 kΩ 3.5 kΩ 13 kΩ 0.3 MΩ 3.7 MΩ	Multiproduct Calibrator
Resistance – Measure [1]	Up 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 (0.1 to 1) GΩ	2 mΩ 3.6 mΩ 14 mΩ 0.14 Ω 1.4 Ω 14 Ω 3.3 kΩ 60 kΩ 1.4 MΩ	Precision Digital Multimeter
AC Voltage – 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	 4.7 µV 4.1 µV 4.2 µV 4.8 µV 10 µV 39 µV 15 µV 11 µV 14 µV 15 µV 39 µV 92 µV 0.12 mV 86 µV 90 µV 0.16 mV 0.28 mV 0.93 mV	Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source [1]	(3.3 to 33) V		Multiproduct Calibrator
	(10 to 45) Hz	1.2 mV	
	45 Hz to 10 kHz	1.2 mV	
	(10 to 20) kHz	1.7 mV	
	(20 to 50) kHz	1.5 mV	
	(50 to 100) kHz	3.1 mV	
	(33 to 330) V		
	45 Hz to 1 kHz	8.7 mV	
	1 kHz to 10 kHz	9.1 mV	
	(10 to 20) kHz	11 mV	
	(20 to 50) kHz	12 mV	
	(50 to 100) kHz	78 mV	
	(330 to 1 020) V		
	45 Hz to 1 kHz	73 mV	
	(1 to 5) kHz	63 mV	
	(5 to 10) kHz	73 mV	
AC Voltage – Measure [1]	Up to 100 mV		Precision Digital Multimeter
	(3 to 5) Hz	27 µV	
	(5 to 10) Hz	27 µV	
	10 Hz to 20 kHz	27 µV	
	(20 to 50) kHz	33 µV	
	(50 to 100) kHz	53 µV	
	(100 to 300) kHz	0.33 mV	
	(0.1 to 1) V		
	(3 to 5) Hz	0.87 mV	
	(5 to 10) Hz	0.43 mV	
	10 Hz to 20 kHz	0.24 mV	
	(20 to 50) kHz	0.41 mV	
	(50 to 100) kHz	0.93 mV	
	(100 to 300) kHz	6 mV	
	(1 to 10) V		
	(3 to 5) Hz	8.7 mV	
	(5 to 10) Hz	4.3 mV	
	10 Hz to 20 kHz	2.4 mV	
	(20 to 50) kHz	4.1 mV	
	(50 to 100) kHz	9.3 mV	
	(100 to 300) kHz	60 mV	

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		Precision Digital Multimeter
	(3 to 5) Hz	87 mV	
	(5 to 10) Hz	43 mV	
	10 Hz to 20 kHz	24 mV	
	(20 to 50) kHz	41 mV	
	(50 to 100) kHz	93 mV	
	(100 to 300) kHz	0.6 V	
	(100 to 1 000) V		
	(3 to 5) Hz	0.82 V	
	(5 to 10) Hz	0.38 V	
	10 Hz to 20 kHz	0.19 V	
	(20 to 50) kHz	0.33 V	
	(50 to 100) kHz	0.8 V	
	(100 to 300) kHz	5.2 V	
AC Current – Source [1]	(29 to 330) µA		Multiproduct Calibrator
	(10 to 20) Hz	0.11 µA	
	(20 to 45) Hz	0.1 µA	
	45 Hz to 1 kHz	96 nA	
	(1 to 5) kHz	0.16 µA	
	(5 to 10) kHz	0.29 µA	
	(10 to 30) kHz	0.58 µA	
	(0.33 to 3.3) mA		
	(10 to 20) Hz	0.55 µA	
	(20 to 45) Hz	0.4 µA	
	45 Hz to 1 kHz	0.4 µA	
	(1 to 5) kHz	0.6 µA	
	(5 to 10) kHz	1.4 µA	
	(10 to 30) kHz	2.6 µA	
	(3.3 to 33) mA		
	(10 to 20) Hz	5.3 µA	
	(20 to 45) Hz	3.3 µA	
	45 Hz to 1 kHz	3.2 µA	
	(1 to 5) kHz	3.7 µA	
	(5 to 10) kHz	7 µA	
	(10 to 30) kHz	12 µA	
	(33 to 330) mA		
	(10 to 20) Hz	55 µA	
	(20 to 45) Hz	37 µA	
	45 Hz to 1 kHz	30 µA	
	(1 to 5) kHz	56 µA	
	(5 to 10) kHz	0.11 mA	
	(10 to 30) kHz	0.22 mA	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source [1]	(0.33 to 1.1) A (10 to 45) Hz 45 Hz to 1kHz (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 (3 to 11) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz to 440 Hz	 0.5 mA 0.2 mA 2 mA 8.8 mA 1.4 mA 0.6 mA 8 mA 22 mA 2.7 mA 3.4 mA 61 mA 17 mA 18 mA	Multiproduct Calibrator
AC Current – Source for Clamp-on Current Meters [1]	(20 to 200) A (45 to 440) Hz (200 to 500) A (45 to 200) Hz (500 to 1 000) A (45 to 200) Hz	 0.44 A 1.2 A 2.5 A	Multiproduct Calibrator, 50-turn Coil
AC Current – Measure [1]	Up to 100 µA (3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz 100 µA to 1 mA (3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz (1 to 10) mA (3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	 0.3 µA 0.14 µA 41 nA 0.5 µA 6 µA 0.74 µA 0.34 µA 1.8 µA 0.1 mA 12 µA 5 µA 49 µA	Precision Digital Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure [1]	(10 to 100) mA		Precision Digital Multimeter
	(3 to 5) Hz	0.8 mA	
	(5 to 10) Hz	0.1 mA	
	10 Hz to 5 kHz	0.2 mA	
	(5 to 10) kHz	0.2 mA	
	(100 to 400) mA		
	(3 to 5) Hz	0.9 mA	
	(5 to 10) Hz	0.5 mA	
	10 Hz to 1 kHz	0.3 mA	
	(1 to 10) kHz	2 mA	
	(0.4 to 1) A		
	(3 to 5) Hz	5.3 mA	
	(5 to 10) Hz	1.7 mA	
	10 Hz to 5 kHz	0.5 mA	
	(5 to 10) kHz	5.6 mA	
	(1 to 3) A		
	(3 to 5) Hz	8.5 mA	
	(5 to 10) Hz	3.5 mA	
	10 Hz to 5 kHz	2.3 mA	
	(5 to 10) kHz	16 mA	
	(3 to 10) A		
	(3 to 5) Hz	26 mA	
	(5 to 10) Hz	11 mA	
	10 Hz to 5 kHz	7.3 mA	
	(5 to 10) kHz	54 mA	
Capacitance – Source [1]			Multiproduct Calibrator (Simulation)
10 Hz to 10 kHz	(0.19 to 0.4) nF	7.3 pF	
10 Hz to 10 kHz	(0.4 to 1.1) nF	10 pF	
10 Hz to 3 kHz	(1.1 to 3.3) nF	12 pF	
10 Hz to 1 kHz	(3.3 to 11) nF	60 pF	
10 Hz to 1 kHz	(11 to 33) nF	0.1 nF	
10 Hz to 1 kHz	(33 to 110) nF	0.6 nF	
10 Hz to 1 kHz	(110 to 330) nF	0.7 nF	
(10 to 600) Hz	(0.33 to 1.1) µF	6.1 nF	
(10 to 300) Hz	(1.1 to 3.3) µF	7 nF	
(10 to 150) Hz	(3.3 to 11) µF	59 nF	
(10 to 120) Hz	(11 to 33) µF	76 nF	
(10 to 80) Hz	(33 to 110) µF	0.6 µF	
DC to 50 Hz	(110 to 330) µF	0.8 µF	
DC to 20 Hz	(0.33 to 1.1) mF	6 µF	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source [1]			Multiproduct Calibrator (Simulation)
DC to 6 Hz	(1.1 to 3.3) mF	12 µF	
DC to 2 Hz	(3.3 to 11) mF	61 µF	
DC to 0.6 Hz	(11 to 33) mF	0.14 mF	
DC to 0.2 Hz	(33 to 110) mF	0.4 mF	
Capacitance – Measure [1]	Up to 1 nF	17 pF	Precision Digital Multimeter
	(1 to 10) nF	41 pF	
	(10 to 100) nF	0.4 nF	
	(0.1 to 1) µF	4 nF	
	(1 to 10) µF	40 nF	
	(10 to 100) µF	0.4 µF	
	(0.1 to 1) mF	4.1 µF	
	(1 to 10) mF	40 µF	
	(10 to 100) mF	1.6 mF	
Electrical Simulation of RTD Indicating Devices – Source [1]	Pt 385, 100 Ω		Multiproduct Calibrator
	(-200 to -80) °C	0.034 °C	
	(-80 to 0) °C	0.034 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 300) °C	0.06 °C	
	(300 to 400) °C	0.07 °C	
	(400 to 630) °C	0.08 °C	
	(630 to 800) °C	0.15 °C	
	Pt 3926, 100 Ω		
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.036 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 300) °C	0.06 °C	
	(300 to 400) °C	0.07 °C	
	(400 to 630) °C	0.08 °C	
	Pt 3916, 100 Ω		
	(-200 to -190) °C	0.17 °C	
	(-190 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.03 °C	
	(0 to 100) °C	0.04 °C	
	(100 to 260) °C	0.05 °C	
	(260 to 300) °C	0.05 °C	
	(300 to 400) °C	0.06 °C	
	(400 to 600) °C	0.07 °C	
	(600 to 630) °C	0.2 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices – Source [1]	Pt 385, 200 Ω		Multiproduct Calibrator
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.03 °C	
	(0 to 100) °C	0.03 °C	
	(100 to 260) °C	0.034 °C	
	(260 to 300) °C	0.08 °C	
	(300 to 400) °C	0.09 °C	
	(400 to 600) °C	0.094 °C	
	(600 to 630) °C	0.11 °C	
	Pt 385, 500 Ω		
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.034 °C	
	(0 to 100) °C	0.034 °C	
	(100 to 260) °C	0.04 °C	
	(260 to 300) °C	0.054 °C	
	(300 to 400) °C	0.05 °C	
	(400 to 600) °C	0.064 °C	
	(600 to 630) °C	0.07 °C	
	Pt 385, 1000 Ω		
	(-200 to -80) °C	0.02 °C	
	(-80 to 0) °C	0.02 °C	
	(0 to 100) °C	0.03 °C	
	(100 to 260) °C	0.03 °C	
	(260 to 300) °C	0.04 °C	
	(300 to 400) °C	0.05 °C	
	(400 to 600) °C	0.05 °C	
	(600 to 630) °C	0.15 °C	
	PtNi 385, 120 Ω		
	(-80 to 0) °C	0.05 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 260) °C	0.09 °C	
	Cu 427, 10 Ω		
	(-100 to 260) °C	0.2 °C	
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure [1]	Type B		Multiproduct Calibrator
	(600 to 800) °C	0.62 °C	
	(800 to 1 000) °C	0.34 °C	
	(1 000 to 1 550) °C	0.31 °C	
	(1 550 to 1 820) °C	0.37 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure [1]	Type C		Multiproduct Calibrator
	(0 to 150) °C	0.42 °C	
	(150 to 650) °C	0.38 °C	
	(650 to 1 000) °C	0.31 °C	
	(1 000 to 1 800) °C	0.5 °C	
	(1 800 to 2 316) °C	0.84 °C	
	Type E		
	(-250 to -100) °C	0.51 °C	
	(-100 to -25) °C	0.16 °C	
	(-25 to 350) °C	0.15 °C	
	(350 to 650) °C	0.17 °C	
	(650 to 1 000) °C	0.21 °C	
	Type J		
	(-210 to -100) °C	0.27 °C	
	(-100 to -30) °C	0.17 °C	
	(-30 to 150) °C	0.14 °C	
	(150 to 760) °C	0.17 °C	
	(760 to 1 200) °C	0.23 °C	
	Type K		
	(-200 to -100) °C	0.34 °C	
	(-100 to -25) °C	0.18 °C	
	(-25 to 120) °C	0.16 °C	
	(120 to 1 000) °C	0.26 °C	
	(1 000 to 1 372) °C	0.4 °C	
	Type L		
	(-200 to -100) °C	0.38 °C	
	(-100 to 800) °C	0.26 °C	
	(800 to 900) °C	0.17 °C	
	Type N		
	(-200 to -100) °C	0.64 °C	
	(-100 to -25) °C	0.54 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 410) °C	0.19 °C	
	(410 to 1 300) °C	0.28 °C	
	Type R		
	(0 to 250) °C	0.48 °C	
	(250 to 400) °C	0.37 °C	
	(400 to 1 000) °C	0.37 °C	
	(1 000 to 1 767) °C	0.46 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure [1]	Type S (0 to 250) °C (250 to 1000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C Type T (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C Type U (-200 to 0) °C (0 to 600) °C	 0.49 °C 0.37 °C 0.37 °C 0.46 °C 0.83 °C 0.59 °C 0.34 °C 0.33 °C 0.57 °C 0.3 °C	Multiproduct Calibrator
DC Power – Source [1] 33 mV to 1 020 V	(0.33 to 330) mA 10.89 µW to 336.6 W (0.33 to 3) A 10.89 mW to 3.06 kW (3 to 20.5) A 99 mW to 20.91 kW	 0.052 % of reading 0.45 % of reading 9.8 % of reading	Multiproduct Calibrator
AC Power – Source [1] (45 to 65) Hz, PF = 1 (33 to 330) mV	(3.3 to 9) mA 108.9 µW to 2.97 mW (9 to 33) mA 297 µW to 10.89 mW (33 to 90) mA (1.09 to 29.7) mW (90 to 330) mA 2.97 mW to 0.11 W (0.33 to 0.9) A 10.89 mW to 0.3 W (0.9 to 2.2) A 29.7 mW to 0.73 W (2.2 to 4.5) A 72.6 mW to 1.48 W (4.5 to 20.5) A 148.5 mW to 6.76 W	 0.002 8 % of reading 0.007 3 % of reading 0.028 % of reading 0.073 % of reading 0.26 % of reading 0.53 % of reading 0.001 3 % of reading 0.005 % of reading	Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source [1]			Multiproduct Calibrator
(45 to 65) Hz, PF = 1			
(0.33 to 1 020) V	(3.3 to 9) mA 108.9 µW to 9.18 W	0.007 3 % of reading	
	(9 to 33) mA 2.97 mW to 33.66 W	0.018 % of reading	
	(33 to 90) mA 10.89 mW to 91.8 W	0.073 % of reading	
	(90 to 330) mA 29.7 mW to 336.6 W	0.18 % of reading	
	(0.33 to 0.9) A 108.9 mW to 918 W	0.67 % of reading	
	(0.9 to 2.2) A 297 mW to 2.24 kW	1.4 % of reading	
	(2.2 to 4.5) A 0.73 W to 4.59 kW	3.7 % of reading	
	(4.5 to 20.5) A 1.48 W to 20.91 kW	14 % of reading	
Oscilloscopes [1]			Multiproduct Calibrator with 600 MHz Scope Option
Amplitude – DC			
into 50 Ω load	(-6 to 6) V	0.001 % of reading + 1.4 µV	
into 1 MΩ load	(-130 to 130) V	0.001 % of reading + 40 µV	
Amplitude – Square Wave			
into 50 Ω load	10 Hz to 10 kHz 1 mVp-p to 6.6 Vp-p	0.01 % of reading + 40 µV	
into 1 MΩ load	10 Hz to 10 kHz 1 mVp-p to 130 Vp-p	0.001 % of reading + 40 µV	
Leveled Sine Wave	5 mVp-p to 5.5 Vp-p		
into 50 Ω load	50 kHz	0.002 % of reading + 4 mV	
	50 kHz to 100 MHz	0.002 1 % of reading + 4.1 mV	
	(100 to 300) MHz	0.004 % of reading + 4 mV	
	(300 to 600) MHz	0.006 % of reading + 4 mV	
Time Markers	10 ns	5 ps	
	20 µs	0.58 ns	
	20 ms	58 ns	
	100 ms	0.58 µs	
	200 ms	36 µs	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes [1] Time Markers Wave Generator into 1 MΩ	 500 ms 1 s 2 s 5s 1.8 mVp-p to 55 Vp-p 10 Hz to 100 kHz	 0.22 ms 0.12 ms 0.12 ms 15 µs 0.07 % of reading + 1.7 mV	Multiproduct Calibrator with 600 MHz Scope Option
DC Withstanding Voltage	(0.1 to 6) kV	1 % of reading + 5 V	GW Instek Power Supply
AC Withstanding Voltage	60 Hz (0.1 to 5) kV	1.5 % of reading + 30 V	GW Instek Power Supply

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Balls [2]	(0.039 37 to 2) in	(13 + 0.4*L*) µin	ULM
Gage Blocks [2]	Up to 24 in	(2.9 + 1.2*L*) µin	Dual Head Comparator, Grade 00 Gage Blocks
Plain Ring Gages [2]	(0.4 to 4) in	(10 + 4.3*L*) µin	ULM, XXX Master Rings
Angle Indicators, Protractors [2]	Up to 360 ° 	1.5″ 30″	Sine Plate, Optical Comparator
Micrometers [1,2] (ID, OD, and Depth)	Up to 6 in (6 to 60) in	(21 + 9.8*L*) µin (34 + 6*L*) µin	Gage Blocks (Federal Grade 2, ASME Grade 0)
Calipers [1,2] (ID, OD, and Depth)	Up to 6 in (6 to 84) in	(57 + 0.96*L*) µin (30 + 3.1*L*) µin	Gage Blocks (Federal Grade 2, ASME Grade 0)
Indicators [1,2]	Up to 2 in	(27 + 1.2*L*) µin	Gage Blocks, ULM
Pin Gages [2]	Up to 1 in	(11 + 1.5*L*) µin	Gage Blocks, ULM
Plain Plug Gages [2]	Up to 2 in (2 to 4) in	(11 + 1.5*L*) µin (3.5 + 6.5*L*) µin	Gage Blocks, ULM
Micrometer Standards (End Rods)	(0.5 to 24) in	15 µin	Gage Blocks, ULM
Rulers [1]	Up to 48 in	0.009 6 in	Master Steel Ruler

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Height Gauges [1,2]	Up to 24 in	(44 + 2.1*L*) µin	Gage Blocks (Federal Grade 2, ASME Grade 0)
Optical Comparators [1]			
Linearity	Up to 10 in	120 µin	Gage Blocks, Glass Master, Angle Plates
X-Y Squareness	Up to 0.5 in	170 µin	
Angle	Up to 90 °	30″	
Magnification	10X, 20X, 31.25X, 50X, 61.25X, and 100X	(25 + 0.06*L*) µin	
Profilometers [1]	Ra: (2 to 250) µin	4.8 nm	Roughness Specimen
Surface Plates [1,2]			
Overall Flatness	Up to 161 in*DL*	(10 + 0.007*DL*) µin	In accordance with ASME B89.3.7 using: Electronic Levels
Local Area Flatness (Repeat Readings)	Up to 0.002 in	20 µin	Repeat-O-Meter
Thread Plug Gages [2]			
Major Diameter	Up to 4 in	(3.5 + 6.5*L*) µin	ULM, Thread Wires
Pitch Diameter	Up to 4 in	72 µin	
Extension Plastometers [1]			
Bore Diameter	Up to 0.25 in	0.003 in	Caliper, Pin Gages, Gage Blocks
Piston Diameter	Up to 1 in	0.001 in	
Coordinate Measuring Machines [1]			
Linear Accuracy	Up to 24 in	(120 + 4*L*) µin	Step Bar
Volumetric Accuracy	Up to 24 in	(270 + 4*L*) µin	Ball Bar
Sphere Repeatability	1 in	170 µin	Sphere

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Class I and Unclassified Balances [1]			ASTM E617 Class 1 weights, NIST HB44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 0.01 mg	Up to 100 g	46 µg	
0.02 mg	Up to 100 g	47 µg	
0.05 mg	Up to 100 g	54 µg	
0.1 mg	Up to 200 g	0.11 mg	
0.2 mg	Up to 200 g	0.15 mg	
0.5 mg	Up to 200 g	0.31 mg	
Class II and Unclassified Balances [1]			ASTM E617 Class 1 or Class 2 weights, NIST HB44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 0.001 g	Up to 100 g	0.4 mg	
0.002 g	Up to 200 g	1.2 mg	
0.005 g	Up to 500 g	2.9 mg	
0.01 g	Up to 1 kg	5.2 mg	
0.02 g	Up to 2 kg	29 mg	
0.05 g	Up to 5 kg	29 mg	
0.1 g	Up to 10 kg	58 mg	
0.2 g	Up to 20 kg	0.27 mg	
0.5 g	Up to 50 kg	0.29 g	
1 g	Up to 50 kg	0.58 g	
2 g	Up to 50 kg	1.2 g	
5 g	Up to 50 kg	2.9 g	
Class III and Unclassified Light Capacity Scales [1]			NIST Class F weights, NIST HB 44, and WI-09 utilized in the calibration of the weighing system.
Resolution: 0.000 1 lb	Up to 1 lb	39 mg	
0.000 2 lb	Up to 2 lb	59 mg	
0.000 5 lb	Up to 5 lb	0.15 g	
0.001 lb	Up to 10 lb	0.33 g	
0.002 lb	Up to 20 lb	1.04 g	
0.005 lb	Up to 50 lb	2.1 g	
0.01 lb	Up to 100 lb	3.4 g	
0.02 lb	Up to 200 lb	5.4 g	
Class III and Unclassified Medium Capacity Scales [1]			NIST Class F weights, Specific Customer Mass, NIST HB 44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 0.05 lb	Up to 500 lb	0.029 lb	
0.1 lb	Up to 1 000 lb	0.058 lb	
0.2 lb	Up to 2 000 lb	0.12 lb	
0.5 lb	Up to 5 000 lb	0.29 lb	
1 lb	Up to 10 000 lb	0.58 lb	
2 lb	Up to 20 000 lb	1.2 lb	
5 lb	Up to 50 000 lb	4.3 lb	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Class IIIL and Unclassified Heavy Capacity Scales [1]			NIST Class F weights, Specific Customer Mass, NIST HB 44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 10 lb	Up to 50 000 lb	6 lb	
20 lb	Up to 200 000 lb	12 lb	
50 lb	Up to 400 000 lb	30 lb	
Class IV and Unclassified Scale s[1]			NIST Class F weights, Specific Customer Mass, NIST HB 44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 10 lb	Up to 12 000 lb	6 lb	
20 lb	Up to 24 000 lb	12 lb	
50 lb	Up to 60 000 lb	30 lb	
Mass – Determination (Avoirdupois)	25 lb	0.1 g	NIST Class F Weights, NIST IR 6969, SOP 4, SOP 5, or SOP 8, Balances
	50 lb	0.13 g	
	250 lb	0.54 g	
	500 lb	6.4 g	
	1 000 lb	7.2 g	
	2 500 lb	50 g	
	3 000 lb	50 g	
	5 000 lb	54 g	
	6 000 lb	75 g	
Mass – Determination [1,3] (Avoirdupois)			Onsite calibration of customer supplied mass using WI-10 modified Single Substitution and Class III, IIIL, or Unclassified Scale.
Resolution: 0.5 lb	(5 000 to 150 000) lb	0.29 lb	
1 lb	(5 000 to 150 000) lb	0.58 lb	
2 lb	(5 000 to 150 000) lb	1.2 lb	
5 lb	(5 000 to 150 000) lb	2.9 lb	
10 lb	(5 000 to 150 000) lb	5.8 lb	
20 lb	(5 000 to 150 000) lb	12 lb	
50 lb	(5 000 to 150 000) lb	29 lb	
Mass – Determination (Avoirdupois)	1 lb	1.1 mg	ASTM E617 Class 4 weights, NIST IR 6969, and SOP 4, SOP 7, or SOP 8, Balances
	2 lb	2.1 mg	
	3 lb	3.2 mg	
	5 lb	5.3 mg	
	10 lb	11 mg	
	20 lb	21 mg	
	30 lb	31 mg	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass – Determination (Avoirdupois)	1/32 oz 1/16 oz 1/8 oz 1/4 oz 1/2 oz 1 oz 2 oz 4 oz 8 oz	22 µg 29 µg 37 µg 52 µg 71 µg 1.1 mg 0.15 mg 0.27 mg 0.53 mg	ASTM E617 Class 4 weights, NIST IR 6969, and SOP 4, SOP 7, or SOP 8, Balances
Mass – Determination (Metric)	20 kg 25 kg 200 kg	0.24 g 0.3 g 5.1 g	NIST Class F Weights, NIST IR 6969, and SOP 4, SOP 5, or SOP 8, Balances
Mass – Determination (Metric)	100 g 200 g 300 g 500 g 1 kg 2 kg 3 kg 4 kg 5 kg 10 kg	0.026 mg 0.048 mg 0.24 mg 0.29 mg 0.51 mg 0.26 mg 0.51 mg 0.68 mg 0.68 mg 1.1 mg	ASTM E617 Class 0 weights, NIST IR 6969, and SOP 4, SOP 7, or SOP 8, Balances
Mass – Determination (Metric)	1 mg 2 mg 3 mg 5 mg 10 mg 20 mg 30 mg 50 mg 100 mg 200 mg 300 mg 500 mg	0.67 µg 0.81 µg 0.76 µg 1.2 µg 0.1 µg 0.84 µg 0.1 µg 6 µg 8.6 µg 7.3 µg 7.5 µg 8.4 µg	ASTM E617 Class 0 weights, NIST IR 6969, and SOP 4, SOP 7, or SOP 8, Balances
Mass – Determination (Metric)	1 g 2 g 3 g 5 g 10 g 20 g 30 g 50 g	2 µg 3 µg 2.7 µg 4.7 µg 6.6 µg 10 µg 7 µg 16 µg	ASTM E617 Class 0 weights, NIST IR 6969, and SOP 4, SOP 7, or SOP 8, Balances

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Gages [1]	(0.25 to 200) lbf (200 to 1 000) lbf (1 000 to 10 000) lbf (10 000 to 100 000) lbf	0.04 lbf 0.06 lbf 0.64 lbf 0.24 lbf	Dead Weights, Load Cells
Pressure Gauges [1]	Up to 3 000 psig Up to 10 000 psig	0.93 psi 0.91 psi	Pressure Calibrator with Pressure Module
Pressure/Vacuum Gages [1]	(-15 to 100) psi	0.074 psi	Pressure Calibrator with Pressure Module
Torque Tools [1]	Up to 50 lbf·in (50 to 250) lbf·in (250 to 400) lbf·in (400 to 1 000) lbf·in (1 000 to 2 500) lbf·in Up to 100 lbf·ft (100 to 250) lbf·ft (250 to 600) lbf·ft (600 to 2 000) lbf·ft	0.08 lbf·in 0.72 lbf·in 1.2 lbf·in 2.9 lbf·in 7.2 lbf·in 0.29 lbf·ft 1.8 lbf·ft 8.1 lbf·ft 11 lbf·ft	Torque Transducers
Torque Transducers [1]	(8 to 83) lbf·ft (83 to 250) lbf·ft (250 to 2 000) lbf·ft	0.012 % of reading 0.018 % of reading 0.032 % of reading	Radius Arms, NIST Class F Weights
Rockwell and Superficial Hardness Testers [1]	HRA 82.9 HRA 84.3 HRB 91.3 HRB 92.9 HRC 25.1 HRC 45.4 HRC 47.3 HRC 64.2	0.97 HRA 0.54 HRA 0.54 HRB 1.5 HRB 1.5 HRC 0.60 HRC 1.4 HRC 0.43 HRC	ASTM E-18 Indirect Verification using Hardness Test Blocks.
Weight Carts	3 000 lb 5 000 lb 6 000 lb	0.17 lb 0.31 lb 0.34 lb	NIST Class F Weights, SOP 33, Balance or Scale
Durometers [2] Spring Force Shore A, B, C Shore D Indenter Geometry Angle Radius	 Up to 822 gf Up to 10 gf (30 to 35) ° 0.098 in	 0.25 gf 0.55 gf 40″ 120 µin	 Durocalibrator Optical Comparator

Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Visible Light – Measure	Up to 2 000 lux	0.05 % reading + 0.000 68 lux	Digital Radiometer
UV-A Light – Measure	(1 000 to 5 000) µW/cm2	0.05 reading + 0.35 µW/cm^2	Digital Radiometer
Gloss Meters 20°, 60°, 85°	(40 to 100) GU	0.65 GU	Standard Gloss Tiles

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity Sensors [1]	(5 to 95) % RH	1.9 % RH	Humidity Chamber, Reference Probe, Thermohygrometer
Infrared Thermometers [1] (non-contact)	35 °C 100 °C 200 °C 350 °C 500 °C	1.2 °C 1.7 °C 2.4 °C 3.7 °C 5 °C	Blackbody Source Ɛ = 0.95, λ = (8 to 14) µm
Temperature – Source [1]	(-70 to 660) °C	0.054 °C	Drywell, Indicator with PRT
	(660 to 1 200) °C	4.9 °C	Drywell, Environmental Chamber, Indicator with Type S Thermocouple Probe
Temperature – Measure [1]	(-200 to 660) °C	0.028 °C	Indicator with PRT
Temperature – Measure [1]	(660 to 1 450) °C	3.5 °C	Indicator with Type S Thermocouple Probe
Extrusion Plastometers [1] Temperature	(100 to 400) °C	0.24 °C	Indicator with Type T Thermocouple Probe

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Stopwatches/Timers [1]	Up to 1 d	3.5 s/d	US National Time, Stopwatch, NIST SP 960-12

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source [1]	10 mHz to 120 Hz 120 Hz to 1.2 kHz (1.2 to 12) kHz (12 to 120) kHz 120 kHz to 1.2 MHz (1.2 to 2) MHz	0.18 mHz 0.2 mHz 59 mHz 0.12 Hz 0.66 Hz 58 Hz	Multiproduct Calibrator
Frequency – Measure [1]	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 1 kHz (1 to 300) kHz 300 kHz to 1 MHz	3.6 mHz 6.9 mHz 16 mHz 19 mHz 0.16 kHz 0.16 kHz	Precision Digital Multimeter
Tachometer [1] (non-contact)	(500 to 40 000) rpm	0.08 % of reading	Comparison to Master Tachometer

DIMENSIONAL MEASUREMENT

2 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Angle [2]	Up to 360 °	36″	Coordinate Measuring Machine

3 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gages, Fixtures	Up to 24 x 12 x 8 in	(250 + 8*L*) µin	Coordinate Measuring Machine

Services performed at satellite location

7133 Global Drive
Louisville, KY 40258

CALIBRATION

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source [1]	Up to 330 mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (100 to 1 000) V	1.6 µV 16 µV 0.13 mV 1.3 mV 3.1 mV	Multiproduct Calibrator
DC Voltage – Measure [1]	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	2.4 µV 6.4 µV 52 µV 0.67 mV 9.6 mV	Precision Digital Multimeter
DC Current – Source [1]	Up to 330 µA (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	14 nA 0.19 µA 0.48 µA 4.4 µA 77 µA 0.31 mA 1.5 mA 23 mA	Multiproduct Calibrator
DC Current – Source for Clamp-on Current Meters [1]	(20 to 200) A (200 to 500) A (500 to 1 000) A	0.41 A 1.1 A 2.1 A	Multiproduct Calibrator, 50-turn Coil
DC Current – Measure [1]	Up to 100 µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (100 to 400) mA (0.4 to 1) A (1 to 3) A (3 to 10) A	0.018 µA 0.67 µA 1.7 µA 6.7 µA 20 µA 0.27 mA 1.1 mA 3.5 mA	Precision Digital Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source [1] (Simulation)	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ	0.7 mΩ 1.4 mΩ 1.7 mΩ 3.4 mΩ 9.6 mΩ 38 mΩ 96 mΩ 0.4 Ω 1 Ω	Multiproduct Calibrator
Resistance – Source [1] (Simulation)	(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 (0.33 to 1.1) GΩ	3.8 Ω 32 Ω 79 Ω 0.4 kΩ 3.5 kΩ 13 kΩ 0.3 MΩ 3.7 MΩ	Multiproduct Calibrator
Resistance – Measure [1]	Up 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 (0.1 to 1) GΩ	2 mΩ 3.6 mΩ 14 mΩ 0.14 Ω 1.4 Ω 14 Ω 3.3 kΩ 60 kΩ 1.4 MΩ	Precision Digital Multimeter
AC Voltage – 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	 4.7 µV 4.1 µV 4.2 µV 4.8 µV 10 µV 39 µV 15 µV 11 µV 14 µV 15 µV 39 µV 92 µV	Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source [1]	(0.33 to 3.3) V		Multiproduct Calibrator
	(10 to 45) Hz	0.12 mV	
	45 Hz to 10 kHz	86 µV	
	(10 to 20) kHz	90 µV	
	(20 to 50) kHz	0.16 mV	
	(50 to 100) kHz	0.28 mV	
	(100 to 500) kHz	0.93 mV	
	(3.3 to 33) V		
	(10 to 45) Hz	1.2 mV	
	45 Hz to 10 kHz	1.2 mV	
	(10 to 20) kHz	1.7 mV	
	(20 to 50) kHz	1.5 mV	
	(50 to 100) kHz	3.1 mV	
	(33 to 330) V		
	45 Hz to 1 kHz	8.7 mV	
	1 kHz to 10 kHz	9.1 mV	
	(10 to 20) kHz	11 mV	
	(20 to 50) kHz	12 mV	
	(50 to 100) kHz	78 mV	
	(330 to 1 020) V		
	45 Hz to 1 kHz	73 mV	
	(1 to 5) kHz	63 mV	
	(5 to 10) kHz	73 mV	
AC Voltage – Measure [1]	Up to 100 mV		Precision Digital Multimeter
	(3 to 5) Hz	27 µV	
	(5 to 10) Hz	27 µV	
	10 Hz to 20 kHz	27 µV	
	(20 to 50) kHz	33 µV	
	(50 to 100) kHz	53 µV	
	(100 to 300) kHz	0.33 mV	
	(0.1 to 1) V		
	(3 to 5) Hz	0.87 mV	
	(5 to 10) Hz	0.43 mV	
	10 Hz to 20 kHz	0.24 mV	
	(20 to 50) kHz	0.41 mV	
	(50 to 100) kHz	0.93 mV	
	(100 to 300) kHz	6 mV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure [1]	(1 to 10) V		Precision Digital Multimeter
	(3 to 5) Hz	8.7 mV	
	(5 to 10) Hz	4.3 mV	
	10 Hz to 20 kHz	2.4 mV	
	(20 to 50) kHz	4.1 mV	
	(50 to 100) kHz	9.3 mV	
	(100 to 300) kHz	60 mV	
	(10 to 100) V		
	(3 to 5) Hz	87 mV	
	(5 to 10) Hz	43 mV	
	10 Hz to 20 kHz	24 mV	
	(20 to 50) kHz	41 mV	
	(50 to 100) kHz	93 mV	
	(100 to 300) kHz	0.6 V	
	(100 to 1 000) V		
	(3 to 5) Hz	0.82 V	
	(5 to 10) Hz	0.38 V	
	10 Hz to 20 kHz	0.19 V	
	(20 to 50) kHz	0.33 V	
	(50 to 100) kHz	0.8 V	
	(100 to 300) kHz	5.2 V	
AC Current – Source [1]	(29 to 330) µA		Multiproduct Calibrator
	(10 to 20) Hz	0.11 µA	
	(20 to 45) Hz	0.1 µA	
	45 Hz to 1 kHz	96 nA	
	(1 to 5) kHz	0.16 µA	
	(5 to 10) kHz	0.29 µA	
	(10 to 30) kHz	0.58 µA	
	(0.33 to 3.3) mA		
	(10 to 20) Hz	0.55 µA	
	(20 to 45) Hz	0.4 µA	
	45 Hz to 1 kHz	0.4 µA	
	(1 to 5) kHz	0.6 µA	
	(5 to 10) kHz	1.4 µA	
	(10 to 30) kHz	2.6 µA	
	(3.3 to 33) mA		
	(10 to 20) Hz	5.3 µA	
	(20 to 45) Hz	3.3 µA	
	45 Hz to 1 kHz	3.2 µA	
	(1 to 5) kHz	3.7 µA	
	(5 to 10) kHz	7 µA	
	(10 to 30) kHz	12 µA	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source [1]	(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 1kHz (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 (3 to 11) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz to 440 Hz	 55 µA 37 µA 30 µA 56 µA 0.11 mA 0.22 mA 0.5 mA 0.2 mA 2 mA 8.8 mA 1.4 mA 0.6 mA 8 mA 22 mA 2.7 mA 3.4 mA 61 mA 17 mA 18 mA	Multiproduct Calibrator
AC Current – Source for Clamp-on Current Meters [1]	(20 to 200) A (45 to 440) Hz (200 to 500) A (45 to 200) Hz (500 to 1 000) A (45 to 200) Hz	 0.44 A 1.2 A 2.5 A	Multiproduct Calibrator, 50-turn Coil
AC Current – Measure [1]	Up to 100 µA (3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz 100 µA to 1 mA (3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	 0.3 µA 0.14 µA 41 nA 0.5 µA 6 µA 0.74 µA 0.34 µA 1.8 µA	Precision Digital Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure [1]	(1 to 10) mA		Precision Digital Multimeter
	(3 to 5) Hz	0.1 mA	
	(5 to 10) Hz	12 µA	
	10 Hz to 5 kHz	5 µA	
	(5 to 10) kHz	49 µA	
	(10 to 100) mA		
	(3 to 5) Hz	0.8 mA	
	(5 to 10) Hz	0.1 mA	
	10 Hz to 5 kHz	0.2 mA	
	(5 to 10) kHz	0.2 mA	
	(100 to 400) mA		
	(3 to 5) Hz	0.9 mA	
	(5 to 10) Hz	0.5 mA	
	10 Hz to 1 kHz	0.3 mA	
	(1 to 10) kHz	2 mA	
	(0.4 to 1) A		
	(3 to 5) Hz	5.3 mA	
	(5 to 10) Hz	1.7 mA	
	10 Hz to 5 kHz	0.5 mA	
	(5 to 10) kHz	5.6 mA	
	(1 to 3) A		
	(3 to 5) Hz	8.5 mA	
	(5 to 10) Hz	3.5 mA	
	10 Hz to 5 kHz	2.3 mA	
	(5 to 10) kHz	16 mA	
	(3 to 10) A		
	(3 to 5) Hz	26 mA	
	(5 to 10) Hz	11 mA	
	10 Hz to 5 kHz	7.3 mA	
	(5 to 10) kHz	54 mA	
Capacitance – Source [1] (Simulation)			Multiproduct Calibrator
10 Hz to 10 kHz	(0.19 to 0.4) nF	7.3 pF	
10 Hz to 10 kHz	(0.4 to 1.1) nF	10 pF	
10 Hz to 3 kHz	(1.1 to 3.3) nF	12 pF	
10 Hz to 1 kHz	(3.3 to 11) nF	60 pF	
10 Hz to 1 kHz	(11 to 33) nF	0.1 nF	
10 Hz to 1 kHz	(33 to 110) nF	0.6 nF	
10 Hz to 1 kHz	(110 to 330) nF	0.7 nF	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source [1] (Simulation)			Multiproduct Calibrator
(10 to 600) Hz	(0.33 to 1.1) µF	6.1 nF	
(10 to 300) Hz	(1.1 to 3.3) µF	7 nF	
(10 to 150) Hz	(3.3 to 11) µF	59 nF	
(10 to 120) Hz	(11 to 33) µF	76 nF	
(10 to 80) Hz	(33 to 110) µF	0.6 µF	
DC to 50 Hz	(110 to 330) µF	0.8 µF	
DC to 20 Hz	(0.33 to 1.1) mF	6 µF	
DC to 6 Hz	(1.1 to 3.3) mF	12 µF	
DC to 2 Hz	(3.3 to 11) mF	61 µF	
DC to 0.6 Hz	(11 to 33) mF	0.14 mF	
DC to 0.2 Hz	(33 to 110) mF	0.4 mF	
Capacitance – Measure [1]	Up to 1 nF	17 pF	Precision Digital Multimeter
	(1 to 10) nF	41 pF	
	(10 to 100) nF	0.4 nF	
	(0.1 to 1) µF	4 nF	
	(1 to 10) µF	40 nF	
	(10 to 100) µF	0.4 µF	
	(0.1 to 1) mF	4.1 µF	
	(1 to 10) mF	40 µF	
	(10 to 100) mF	1.6 mF	
Electrical Simulation of RTD Indicating Devices – Source [1]	Pt 385, 100 Ω		Multiproduct Calibrator
	(-200 to -80) °C	0.034 °C	
	(-80 to 0) °C	0.034 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 300) °C	0.06 °C	
	(300 to 400) °C	0.07 °C	
	(400 to 630) °C	0.08 °C	
	(630 to 800) °C	0.15 °C	
	Pt 3926, 100 Ω		
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.036 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 300) °C	0.06 °C	
	(300 to 400) °C	0.07 °C	
	(400 to 630) °C	0.08 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices – Source [1]	Pt 3916, 100 Ω		Multiproduct Calibrator
	(-200 to -190) °C	0.17 °C	
	(-190 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.03 °C	
	(0 to 100) °C	0.04 °C	
	(100 to 260) °C	0.05 °C	
	(260 to 300) °C	0.05 °C	
	(300 to 400) °C	0.06 °C	
	(400 to 600) °C	0.07 °C	
	(600 to 630) °C	0.2 °C	
	Pt 385, 200 Ω		
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.03 °C	
	(0 to 100) °C	0.03 °C	
	(100 to 260) °C	0.034 °C	
	(260 to 300) °C	0.08 °C	
	(300 to 400) °C	0.09 °C	
	(400 to 600) °C	0.094 °C	
	(600 to 630) °C	0.11 °C	
	Pt 385, 500 Ω		
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.034 °C	
	(0 to 100) °C	0.034 °C	
	(100 to 260) °C	0.04 °C	
	(260 to 300) °C	0.054 °C	
	(300 to 400) °C	0.05 °C	
	(400 to 600) °C	0.064 °C	
	(600 to 630) °C	0.07 °C	
	Pt 385, 1000 Ω		
	(-200 to -80) °C	0.02 °C	
	(-80 to 0) °C	0.02 °C	
	(0 to 100) °C	0.03 °C	
	(100 to 260) °C	0.03 °C	
	(260 to 300) °C	0.04 °C	
	(300 to 400) °C	0.05 °C	
	(400 to 600) °C	0.05 °C	
	(600 to 630) °C	0.15 °C	
	PtNi 385, 120 Ω		
	(-80 to 0) °C	0.05 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 260) °C	0.09 °C	
	Cu 427, 10 Ω		
	(-100 to 260) °C	0.2 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure [1]	Type B		Multiproduct Calibrator
	(600 to 800) °C	0.62 °C	
	(800 to 1 000) °C	0.34 °C	
	(1 000 to 1 550) °C	0.31 °C	
	(1 550 to 1 820) °C	0.37 °C	
	Type C		
	(0 to 150) °C	0.42 °C	
	(150 to 650) °C	0.38 °C	
	(650 to 1 000) °C	0.31 °C	
	(1 000 to 1 800) °C	0.5 °C	
	(1 800 to 2 316) °C	0.84 °C	
	Type E		
	(-250 to -100) °C	0.51 °C	
	(-100 to -25) °C	0.16 °C	
	(-25 to 350) °C	0.15 °C	
	(350 to 650) °C	0.17 °C	
	(650 to 1 000) °C	0.21 °C	
	Type J		
	(-210 to -100) °C	0.27 °C	
	(-100 to -30) °C	0.17 °C	
	(-30 to 150) °C	0.14 °C	
	(150 to 760) °C	0.17 °C	
	(760 to 1 200) °C	0.23 °C	
	Type K		
	(-200 to -100) °C	0.34 °C	
	(-100 to -25) °C	0.18 °C	
	(-25 to 120) °C	0.16 °C	
	(120 to 1 000) °C	0.26 °C	
	(1 000 to 1 372) °C	0.4 °C	
	Type L		
	(-200 to -100) °C	0.38 °C	
	(-100 to 800) °C	0.26 °C	
	(800 to 900) °C	0.17 °C	
	Type N		
	(-200 to -100) °C	0.64 °C	
	(-100 to -25) °C	0.54 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 410) °C	0.19 °C	
	(410 to 1 300) °C	0.28 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure [1]	Type R (0 to 250) °C (250 to 400) °C (400 to 1 000) °C (1 000 to 1 767) °C Type S (0 to 250) °C (250 to 1000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C Type T (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C Type U (-200 to 0) °C (0 to 600) °C	 0.48 °C 0.37 °C 0.37 °C 0.46 °C 0.49 °C 0.37 °C 0.37 °C 0.46 °C 0.83 °C 0.59 °C 0.34 °C 0.33 °C 0.57 °C 0.3 °C	Multiproduct Calibrator
DC Power – Source [1] 33 mV to 1 020 V	(0.33 to 330) mA 10.89 µW to 336.6 W (0.33 to 3) A 10.89 mW to 3.06 kW (3 to 20.5) A 99 mW to 20.91 kW	 0.052 % of reading 0.45 % of reading 9.8 % of reading	Multiproduct Calibrator
AC Power – Source [1] (45 to 65) Hz, PF = 1 (33 to 330) mV	(3.3 to 9) mA 108.9 µW to 2.97 mW (9 to 33) mA 297 µW to 10.89 mW (33 to 90) mA (1.09 to 29.7) mW (90 to 330) mA 2.97 mW to 0.11 W (0.33 to 0.9) A 10.89 mW to 0.3 W (0.9 to 2.2) A 29.7 mW to 0.73 W (2.2 to 4.5) A 72.6 mW to 1.48 W (4.5 to 20.5) A 148.5 mW to 6.76 W	 0.002 8 % of reading 0.007 3 % of reading 0.028 % of reading 0.073 % of reading 0.26 % of reading 0.53 % of reading 0.001 3 % of reading 0.005 % of reading	Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source [1]			Multiproduct Calibrator
(45 to 65) Hz, PF = 1			
(0.33 to 1 020) V	(3.3 to 9) mA 108.9 µW to 9.18 W	0.007 3 % of reading	
	(9 to 33) mA 2.97 mW to 33.66 W	0.018 % of reading	
	(33 to 90) mA 10.89 mW to 91.8 W	0.073 % of reading	
	(90 to 330) mA 29.7 mW to 336.6 W	0.18 % of reading	
	(0.33 to 0.9) A 108.9 mW to 918 W	0.67 % of reading	
	(0.9 to 2.2) A 297 mW to 2.24 kW	1.4 % of reading	
	(2.2 to 4.5) A 0.73 W to 4.59 kW	3.7 % of reading	
	(4.5 to 20.5) A 1.48 W to 20.91 kW	14 % of reading	
Oscilloscopes [1]			Multiproduct Calibrator with 600 MHz Scope Option
Amplitude – DC			
into 50 Ω load	(-6 to 6) V	0.001 % of reading + 1.4 µV	
into 1 MΩ load	(-130 to 130) V	0.001 % of reading + 40 µV	
Amplitude – Square Wave			
into 50 Ω load	10 Hz to 10 kHz 1 mVp-p to 6.6 Vp-p	0.01 % of reading + 40 µV	
into 1 MΩ load	10 Hz to 10 kHz 1 mVp-p to 130 Vp-p	0.001 % of reading + 40 µV	
Leveled Sine Wave	5 mVp-p to 5.5 Vp-p		
into 50 Ω load	50 kHz	0.002 % of reading + 4 mV	
	50 kHz to 100 MHz	0.002 1 % of reading + 4.1 mV	
	(100 to 300) MHz	0.004 % of reading + 4 mV	
	(300 to 600) MHz	0.006 % of reading + 4 mV	
Time Markers	10 ns	5 ps	
	20 µs	0.58 ns	
	20 ms	58 ns	
	100 ms	0.58 µs	
	200 ms	36 µs	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes [1]			
Time Markers	500 ms 1 s 2 s 5s	0.22 ms 0.12 ms 0.12 ms 15 µs	Multiproduct Calibrator with 600 MHz Scope Option
Wave Generator into 1 MΩ	1.8 mVp-p to 55 Vp-p 10 Hz to 100 kHz	0.07 % of reading + 1.7 mV	
DC Withstanding Voltage	(0.1 to 6) kV	1 % of reading + 5 V	GW Instek Power Supply
AC Withstanding Voltage	60 Hz (0.1 to 5) kV	1.5 % of reading + 30 V	GW Instek Power Supply

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers [1,2] (ID, OD, and Depth)	Up to 6 in (6 to 60) in	(21 + 9.8*L*) µin (34 + 6*L*) µin	Gage Blocks (Federal Grade 2, ASME Grade 0)
Calipers [1,2] (ID, OD, and Depth)	Up to 6 in (6 to 84) in	(57 + 0.96*L*) µin (30 + 3.1*L*) µin	Gage Blocks (Federal Grade 2, ASME Grade 0)
Surface Plates [1,2]			In accordance with ASME B89.3.7 using:
Overall Flatness	Up to 161 in*DL*	(10 + 0.007*DL*) µin	Electronic Levels
Local Area Flatness (Repeat Readings)	Up to 0.002 in	20 µin	Repeat-O-Meter

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Class I and Unclassified Balances [1]			ASTM E617 Class 1 weights, NIST HB44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 0.01 mg	Up to 100 g	46 µg	
0.02 mg	Up to 100 g	47 µg	
0.05 mg	Up to 100 g	54 µg	
0.1 mg	Up to 200 g	0.11 mg	
0.2 mg	Up to 200 g	0.15 mg	
0.5 mg	Up to 200 g	0.31 mg	
Class II and Unclassified Balances [1]			ASTM E617 Class 1 or Class 2 weights, NIST HB44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 0.001 g	Up to 100 g	0.4 mg	
0.002 g	Up to 200 g	1.2 mg	
0.005 g	Up to 500 g	2.9 mg	
0.01 g	Up to 1 kg	5.2 mg	
0.02 g	Up to 2 kg	29 mg	
0.05 g	Up to 5 kg	29 mg	
0.1 g	Up to 10 kg	58 mg	
0.2 g	Up to 20 kg	0.27 mg	
0.5 g	Up to 50 kg	0.29 g	
1 g	Up to 50 kg	0.58 g	
2 g	Up to 50 kg	1.2 g	
5 g	Up to 50 kg	2.9 g	
Class III and Unclassified Light Capacity Scales [1]			NIST Class F weights, NIST HB 44, and WI-09 utilized in the calibration of the weighing system.
Resolution: 0.000 1 lb	Up to 1 lb	39 mg	
0.000 2 lb	Up to 2 lb	59 mg	
0.000 5 lb	Up to 5 lb	0.15 g	
0.001 lb	Up to 10 lb	0.33 g	
0.002 lb	Up to 20 lb	1.04 g	
0.005 lb	Up to 50 lb	2.1 g	
0.01 lb	Up to 100 lb	3.4 g	
0.02 lb	Up to 200 lb	5.4 g	
Class III and Unclassified Medium Capacity Scales [1]			NIST Class F weights, Specific Customer Mass, NIST HB 44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 0.05 lb	Up to 500 lb	0.029 lb	
0.1 lb	Up to 1 000 lb	0.058 lb	
0.2 lb	Up to 2 000 lb	0.12 lb	
0.5 lb	Up to 5 000 lb	0.29 lb	
1 lb	Up to 10 000 lb	0.58 lb	
2 lb	Up to 20 000 lb	1.2 lb	
5 lb	Up to 50 000 lb	4.3 lb	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Class IIIL and Unclassified Heavy Capacity Scales [1]			NIST Class F weights, Specific Customer Mass, NIST HB 44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 10 lb	Up to 50 000 lb	6 lb	
20 lb	Up to 200 000 lb	12 lb	
50 lb	Up to 400 000 lb	30 lb	
Class IV and Unclassified Scales[1]			NIST Class F weights, Specific Customer Mass, NIST HB 44 and WI-09 utilized in the calibration of the weighing system.
Resolution: 10 lb	Up to 12 000 lb	6 lb	
20 lb	Up to 24 000 lb	12 lb	
50 lb	Up to 60 000 lb	30 lb	
Mass – Determination [1,3] (Avoirdupois)			Onsite calibration of customer supplied mass using WI-10 modified Single Substitution and Class III, IIIL, or Unclassified Scale.
Resolution: 0.5 lb	(5 000 to 150 000) lb	0.29 lb	
1 lb	(5 000 to 150 000) lb	0.58 lb	
2 lb	(5 000 to 150 000) lb	1.2 lb	
5 lb	(5 000 to 150 000) lb	2.9 lb	
10 lb	(5 000 to 150 000) lb	5.8 lb	
20 lb	(5 000 to 150 000) lb	12 lb	
50 lb	(5 000 to 150 000) lb	29 lb	
Force Gages [1]	(0.25 to 200) lbf	0.04 lbf	Dead Weights, Load Cells
	(200 to 1 000) lbf	0.06 lbf	
	(1 000 to 10 000) lbf	0.64 lbf	
	(10 000 to 100 000) lbf	0.24 lbf	
Pressure Gauges [1]	Up to 3 000 psig	0.93 psi	Pressure Calibrator with Pressure Module
	Up to 10 000 psig	0.91 psi	
Pressure/Vacuum Gages [1]	(-15 to 100) psi	0.074 psi	Pressure Calibrator with Pressure Module
Torque Tools [1]	Up to 50 lbf·in	0.08 lbf·in	Torque Transducers
	(50 to 250) lbf·in	0.72 lbf·in	
	(250 to 400) lbf·in	1.2 lbf·in	
	(400 to 1 000) lbf·in	2.9 lbf·in	
	(1 000 to 2 500) lbf·in	7.2 lbf·in	
	Up to 100 lbf·ft	0.29 lbf·ft	
	(100 to 250) lbf·ft	1.8 lbf·ft	
	(250 to 600) lbf·ft	8.1 lbf·ft	
	(600 to 2 000) lbf·ft	11 lbf·ft	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity Sensors [1]	(5 to 95) % RH	1.9 % RH	Humidity Chamber, Reference Probe, Thermohygrometer
Temperature – Source [1]	(-70 to 660) °C	0.054 °C	Drywell, Indicator with PRT
	(660 to 1 200) °C	4.9 °C	Drywell, Environmental Chamber, Indicator with Type S Thermocouple Probe
Temperature – Measure [1]	(-200 to 660) °C	0.028 °C	Indicator with PRT
Temperature – Measure [1]	(660 to 1 450) °C	3.5 °C	Indicator with Type S Thermocouple Probe

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source [1]	10 mHz to 120 Hz 120 Hz to 1.2 kHz (1.2 to 12) kHz (12 to 120) kHz 120 kHz to 1.2 MHz (1.2 to 2) MHz	0.18 mHz 0.2 mHz 59 mHz 0.12 Hz 0.66 Hz 58 Hz	Multiproduct Calibrator
Frequency – Measure [1]	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 1 kHz (1 to 300) kHz 300 kHz to 1 MHz	3.6 mHz 6.9 mHz 16 mHz 19 mHz 0.16 kHz 0.16 kHz	Precision Digital Multimeter

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. R = Resolution of the device; L = length in inches; $''$ = arc-second; DL = Diagonal Length in inches.
3. The uncertainties for mass calibration onsite using WI-10 do not account for local environmental contributors. These contributors will be included in the reported uncertainties at the time of calibration.
4. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1222.

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