CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Indiana Standards Laboratory

2919 Shelby Street
Indianapolis, IN 46203-5236

Fulfills the requirements of

ISO/IEC 17025:2017

In the fields 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.

Jason Stine, Vice President

Expiry Date: 31 December 2026

Certificate Number: L2222

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

Indiana Standards Laboratory

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CALIBRATION AND DIMENSIONAL MEASUREMENT

Valid to: **December 31, 2026** Certificate Number: **L2222**

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Calibrator	114 dB 125 Hz to 1 kHz 114 dB 2 kHz	0.23 dB 0.34 dB	Comparison to GR 1562A Calibrator
	94 dB 250 Hz, 1 kHz	0.23 dB	Comparison to B&K 2206 SL Meter GRAS 42AG Sound Calibrator Agilent 34411A DMM
Sound Level Meters [1] Sound Level	114 dB 125 Hz to 1 kHz 114 dB 2 kHz	0.25 dB 0.33 dB	Comparison to GR 1562A Calibrator
	94 dB 250 Hz, 1 kHz	0.26 dB	Comparison to GRAS 42AG Sound Calibrator
Sound Level Meters [1] Linearity	(0 to 120) dB 1 kHz	0.063 dB	Comparison to Ratio Transformer Agilent 3458A DMM

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters [1]	(4, 7, 10) pH	0.02 pH	Comparison to Standard pH Buffers and Thermometer 0.1 °C
Conductivity Meters [1]	10 µS/cm 100 µS/cm 1 000 µS/cm 10 000 µS/cm 100 000 µS/cm 1 412 µS/cm	0.57 µS/cm 2.3 µS/cm 5.6 µS/cm 49 µS/cm 450 µS/cm 5.5 µS/cm	Comparison to Standard Solutions
Refractive Index Brix	(0.1 to 20) Brix	0.2 % of reading	Comparison to Scale, Sugar Distilled Water

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance (Source)	(0.1 to 1) pF (1 to 10) pF	0.000 2 pF + 45 μF/F 0.001 4 pF + 50 μF/F	Comparison to GR 1422-CD Capacitor GR 1615A Bridge
	(10 to 100) pF	0.000 78 pF + 10 μF/F	Comparison to GR 1422-CL Capacitor GR 1615A Bridge
	(100 to 1 000) pF	0.003 6 pF + 23 μF/F	Comparison to GR-1422-CB Capacitor GR-1615A Bridge
	(1 to 10) nF (10 to 100) nF (100 to 1 000) nF	0.000 004 2 nF + 17 μF/F 0.000 14 nF + 29 μF/F 0.000 13 nF + 37 μF/F	Comparison to GR 1423A Capacitor GR 1615A Bridge
	(1 to 10) μF (10 to 100) μF	220 μF/F 530 μF/F	Comparison to ISL Polaris Capacitance Decade GR 1615A Bridge
Capacitance (Measure)	(0.1 to 1) pF	0.000 03 pF + 60 μF/F	Comparison to GR1615A Bridge GR 1403-K Capacitor
	(1 to 10) pF	0.000 051 pF + 16 μF/F	Comparison to GR 1615A Bridge GR 1403-G Capacitor

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance (Measure)	(10 to 100) pF (100 to 1 000) pF (1 to 10) nF	0.000 076 pF + 7.2 μF/F 0.000 21 pF + 7.7 μF/F 0.000 001 9 nF + 11 μF/F	Comparison to GR 1615A Bridge GR 1404-B Capacitor
Capacitance (Measure)	(10 to 100) nF	0.000 1 nF + 21 μF/F	Comparison to GR 1615A Bridge GR 1615-P1 Bridge
Capacitance (Measure)	(100 to 1 000) nF	0.000 41 nF + 27 μF/F	Comparison to GR 1615A Bridge, GR 1409-T Capacitor
	(1 to 10) μF	0.000 008 6 μF + 210 μF/F	Comparison to GR 1615A Bridge
	(10 to 100) μF	-0.000 014 μF + 530 μF/F	Comparison to GR 1689M RLC Bridge
AC Current (Source) [1]	(0.1 to 1) mA (10 to < 50) Hz (0.1 to 1) mA (0.05 to 1) kHz (0.1 to 1) mA (> 1 to 5) kHz (0.1 to 1) mA (>5 to 10) kHz (>1 to 10) mA (10 to <50) Hz (>1 to 10) mA (0.05 to 1) kHz (>1 to 10) mA (>1 to 5) kHz (>1 to 10) mA (>5 to 10) kHz	160 μA/A + 0.3 nA 88 μA/A 100 μA/A + 0.5 nA 240 μA/A + 3.1 nA 150μA/A + 1.5 nA 84 μA/A + 1.2 nA 83 μA/A + 10 nA 90 μA/A + 74 nA	Comparison to GR 1440 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
AC Current (Source) [1]	(>10 to 100) mA (10 to <50) Hz (>10 to 100) mA (0.05 to 1) kHz (>10 to 100) mA (>1 to 5) kHz (>10 to 100) mA (>5 to 10) kHz (>0.1 to 1) A (10 to <50) Hz	150 μA/A 90 μA/A 96 μA/A + 22 nA) 110 μA/A + 36 n 150 μA/A	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current (Source) [1]	(>0.1 to 1) A (0.05 to 1) kHz	91 μA/A	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
	(>0.1 to 1) A (>1 to 5) kHz	100 μA/A – 0.74 μA	
	(>0.1 to 1) A (>5 to 10) kHz	160 μA/A + 5 μA	
	(>1 to 10) A (10 to <50) Hz	160 μA/A	
AC Current (Source) [1]	(>1 to 10) A (0.05 to 1) kHz	96 μA/A – 2.2 μA	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
AC Current (Source) [1]	(>1 to 10) A (>1 to 5) kHz	150 μA/A – 49 μA	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
AC Current (Source) [1]	(>10 to 20) A (10 to <50) Hz	150 μA/A + 110 μA	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
	(>10 to 20) A (0.05 to 1) kHz	100 μA/A	
	(>10 to 20) A (>1 to 5) kHz	160 μA/A	
AC Current (Measure) [1]	(0.1 to 1) mA (10 to <50) Hz	160 μA/A + 0.3 nA	Comparison to GR 1440 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
	(0.1 to 1) mA (0.05 to 1) kHz	88 μA/A	
	(0.1 to 1) mA (>1 to 5) kHz	100 μA/A + 0.5 nA	
	(0.1to 1) mA (>5 to 10) kHz	240 μA/A + 3.1 nA	
	(>1 to 10) mA (10 to <50) Hz	150 μA/A + 1.5 nA	
	(>1 to 10) mA (0.05 to 1) kHz	84 μA/A + 1.2 nA	
	(>1 to 10) mA (>1 to 5) kHz	83 μA/A + 10 nA	
	(>1 to 10) mA (>5 to 10) kHz	90 μA/A + 74 nA	

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 (10 to <50) Hz	150 μA/A	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
	(>10 to 100) mA (0.05 to 1) kHz	90 μA/A	
	(>10 to 100) mA (>1 to 5) kHz	96 μA/A + 22 nA	
	(>10 to 100) mA (>5 to 10) kHz	110 μA/A + 36 nA	
	(>0.1 to 1) A (10 to <50) Hz	150 μA/A	
AC Current (Measure) [1]	(>0.1 to 1) A (0.05 to 1) kHz	91 μA/A	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
	(>0.1 to 1) A (>1 to 5) kHz	100 μA/A – 0.74 μA	
AC Current (Measure) [1]	(>1 to 1) A (>5 to 10) kHz	160 μA/A – 5 μA	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
AC Current (Measure) [1]	(>1 to 10) A (10 to <50) Hz	160 μA/A	Comparison to Holt CS1 Shunt, Holt 6A Thermal Transfer Standard, Agilent 3458A Multimeter
	(>1 to 10) A (0.05 to 1) kHz	96 μA/A – 2.2 μA	
	(>1 to 10) A (>1 to 5) kHz	150 μA/A – 49 μA	
	(>1 to 10) A (>5 to 10) kHz	260 μA/A – 110 μA	
	(>10 to 20) A (10 to <50) Hz	150 μA/A + 110 μA	
	(>10 to 20) A (0.05 to 1) kHz	100 μA/A	
	(>10 to 20) A (>1 to 5) kHz	160 μA/A	
	(>10 to 20) A (>5 to 10) kHz	250 μA/A	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current (Source & Measure) [1,3]	(0 to 1) nA	0.1 % reading + 160 fA	Comparison to Monitored Multifunction Calibrator, Agilent 3458A Multimeter, Standard Resistor
	(>1 to 10) nA	55 μA/A + 1.1 pA	
	(>10 to 100) nA	1.5 μA/A + 5.8 pA	
	>100 nA to 1μA	0.4 μA/A + 24 pA	
	(>1 to 10) μA	1.2 μA/A + 62 pA	
	(>10 to 100) μA	1 μA/A + 570 pA	
	>100 μA to 1 mA	1.1 μA/A + 5.7 nA	
DC Current (Source & Measure) [1,3]	(>1 to 10) mA	1 μA/A + 57 nA	Comparison to Monitored Multifunction Calibrator Agilent 3458A Multimeter Standard Resistor
	(>10 to 100) mA	1.1 μA/A + 570 nA	
	>100 mA to 2 A	4.1 μA/A + 5.5 μA	
	(>2 to 10) A	22 μA/A + 32 μA	Comparison to Transconductance Amplifier, Agilent 3458A Multimeter, Standard Shunt
	(>10 to 20) A	49 μA/A - 14 μA	
DC Current (Source & Measure) [1,3]	(>20 to 100) A	67 μA/A - 370 μA	Comparison to Power Supply, Agilent 3458A Multimeter, Standard Shunt
DC Current (Measure) [1,3]	(>100 to 1 000) A	0.53 mA + 0.1 % of reading	Comparison to Agilent 3458A Multimeter, Standard Shunt
	(>1 000 to 2 000) A	0.13 % of reading + 32 mA	
DC Current (Simulated Source) [1]	(20 to 40) ADC	0.04 A + 0.39 % of reading	Comparison to Transconductance Amplifier, Current Coil
	(40 to 200) ADC	0.037 A + 0.48 % of reading	
	(200 to 1 000) ADC	0.31 A + 0.32 % of reading	
Inductance (Source)	100 μH @ 1 kHz	0.08 % of nominal	Comparison to General Radio 1482-B Inductor

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Inductance (Source)	1 mH @ 1 kHz	0.02 % of nominal	Comparison to General Radio 1482-E Inductor
	10 mH @ 100 Hz 10 mH @ 1 kHz	0.07 % of nominal 0.02 % of nominal	Comparison to General Radio 1482-H Inductor
	100 mH @ 100 Hz 100 mH @ 1 kHz	0.08 % of nominal 0.02 % of nominal	Comparison to General Radio 1482-L Inductor
	1 H @ 100 Hz 1 H @ 1 kHz	0.07 % of nominal 0.02 % of nominal	Comparison to General Radio 1482-P Inductor
	10 H @ 100 Hz 10 H @ 1 kHz	0.07 % of nominal 0.02 % of nominal	Comparison to General Radio 1482-T Inductor
Inductance (Measure)	100 μH @ 1 kHz 1 mH @ 1 kHz 10 mH @ 100 Hz 10 mH @ 1 kHz 100 mH @ 100 Hz 100 mH @ 1 kHz 1 H @ 100 Hz 1 H @ 1 kHz 10 H @ 100 Hz 10 H @ 1 kHz	0.1 % of reading 0.03 % of reading 0.09 % of reading 0.03 % of reading 0.09 % of reading 0.03 % of reading 0.08 % of reading 0.03 % of reading 0.09 % of reading 0.03 % of reading	Comparison to General Radio 1689 RLC Bridge
Magnetometers / Flux Meters	(0 to 20) G (20 to 200) G (200 to 2 000) G (2 000 to 20 000) G	0.014 G + 1.2 % of reading 0.19 G + 1.2 % of reading 1.6 G + 0.82 % of reading 19 G + 0.73 % of reading	Comparison to Gauss Meter With Transverse Probe, Helmholtz Coil
Resistance Fixed Point (Source) [1]	100 $\mu\Omega$ 1 mΩ 10 mΩ 100 mΩ	4.2 $\mu\Omega/\Omega$ 2.8 $\mu\Omega/\Omega$ 2.2 $\mu\Omega/\Omega$ 1.8 $\mu\Omega/\Omega$	Comparison to Otto Wolff 0.0001 Resistor, Guildline 9975 Comparator, Guildline 9923 Extender 1 Ω Standard

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Fixed Point (Source) [1]	1 Ω	1.6 μΩ/Ω	Comparison to Guildline 9975 Comparator, 1 Ω Standard
	10 Ω 100 Ω 1 kΩ	1.2 μΩ/Ω 1.4 μΩ/Ω 1.2 μΩ/Ω	Comparison to Guildline 9975 Comparator, 100 Ω Standard
	10 kΩ	1.7 μΩ/Ω	Comparison to Guildline 9975 Comparator, 1 kΩ Standard
	100 kΩ	2.3 μΩ/Ω	Comparison to Guildline 9975 Comparator, 10 kΩ Standard
	1 MΩ	3.3 μΩ/Ω	Comparison to Guildline 9975 Comparator, 100 kΩ Standard
	10 MΩ	4.6 μΩ/Ω	Comparison to Agilent 3458A Multimeter, 1 MΩ Standard, 1 MΩ per step Decade
	100 MΩ	19 μΩ/Ω	Comparison to Agilent 3458A Multimeter, 10 MΩ Standard, 10 MΩ per step Decade
	1 GΩ	110 μΩ/Ω	Comparison to 1 GΩ Fixed Point Source, Agilent 3458A Multimeter, 100 MΩ Standard 100 MΩ per step Decade
	10 GΩ	0.085 % of reading	Comparison to Leeds Northrup 4232B Bridge 1 GΩ Standard 1 GΩ per step Decade
	100 GΩ	0.21 % of reading	Comparison to Wavetek 4800A Multifunction Calibrator, Agilent 3458A Multimeter, 100 GΩ Standard, 1 MΩ Standard

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Ranges (Source) [1]	100 μΩ to 1 mΩ	70 μΩ/Ω	Comparison to Guildline 9975A Comparator, Leeds & Northrup 4300 Milliohm Standard, 1 Ω Fixed Point Resistor
	(1 to 10) mΩ	-0.002 μΩ + 5.6 μΩ/Ω	Comparison to Guildline 9975A Comparator, Leeds & Northrup 4300 Milliohm Standard
	(10 to 100) mΩ	2.3 μΩ + 28 μΩ/Ω	Comparison to ESI RS925D Decade Resistor, Leeds & Northrup 4222-B Resistor Agilent 3458A Multimeter
	100 mΩ to 1 Ω	1.1 μΩ + 14 μΩ/Ω	Comparison to ESI RS925D Decade Resistor, Leeds & Northrup 4020-B Resistor Agilent 3458A Multimeter
	(1 to 10) Ω	9.9 μΩ + 2.3 μΩ/Ω	Comparison to ESI RS925A Decade Resistor, Agilent 3458A Multimeter, 10 Ω Fixed Point
	(10 to 100) Ω	90 μΩ + 1.7 μΩ/Ω	Comparison to ESI RS925A Decade Resistor, Agilent 3458A Multimeter, 100 Ω Fixed Point
	100 Ω to 1 kΩ	44 μΩ + 2.1 μΩ/Ω	Comparison to ESI RS925A Decade Resistor, Agilent 3458A Multimeter, 1 kΩ Fixed Point
	(1 to 10) kΩ	350 μΩ + 2.5 μΩ/Ω	Comparison to ESI RS925A Decade Resistor, Agilent 3458A Multimeter, 10 kΩ Fixed Point
	(10 to 100) kΩ	3 mΩ + 2.9 μΩ/Ω	Comparison to ESI RS925A Decade Resistor Agilent 3458A Multimeter 100 kΩ Fixed Point

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Ranges (Source) [1]	100 kΩ to 1 MΩ	140 mΩ + 3.9 μΩ/Ω	Comparison to ESI RS925A Decade Resistor Agilent 3458A Multimeter 1MΩ Fixed Point
	(1 to 10) MΩ (10 to 100) MΩ	6.8 Ω + 7 μΩ/Ω 250 Ω + 59 μΩ/Ω	Comparison to Agilent 3458A Multimeter, PPM-R3-1111 Decade Resistor 1 MΩ Fixed Point
	100 MΩ to 1 GΩ	-0.014 Ω + 290 μΩ/Ω	Comparison to PPM-R3-1111 Decade Resistor Leeds & Northrup 4232B Bridge
Resistance Fixed Point (Measure) [1]	100 μΩ 1 m Ω 10 mΩ 100 mΩ	4.2 μΩ/Ω 2.8 μΩ/Ω 2.2 μΩ/Ω 1.8 μΩ/Ω	Comparison to Otto Wolff 0.0001 Resistor Guildline 9975 Comparator, Guildline 9923 Extender 1 Ω Standard
	1 Ω	1.6 μΩ/Ω	Comparison to Guildline 9975 Comparator, 1 Ω Standard
	10 Ω 100 Ω 1 kΩ	1.2 μΩ/Ω 1.4 μΩ/Ω 1.2 μΩ/Ω	Comparison to Guildline 9975 Comparator, 100 Ω Standard
	10 kΩ	1.7 μΩ/Ω	Comparison to Guildline 9975 Comparator, 1 kΩ Standard
	100 kΩ	2.3 μΩ/Ω	Comparison to Guildline 9975 Comparator, 10 kΩ Standard
	1 MΩ	3.3 μΩ/Ω	Comparison to Guildline 9975 Comparator, 100 kΩ Standard
	10 MΩ	7.5 μΩ/Ω	Comparison to Agilent 3458A Multimeter, 10 MΩ Fixed Point Reference
	100 MΩ	61 μΩ/Ω	Comparison to Agilent 3458A Multimeter, 100 MΩ Fixed Point Reference Decade

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Fixed Point (Measure) [1]	1 GΩ	390 μΩ/Ω	Comparison to Agilent 3458A Multimeter, 1 GΩ Fixed Point Reference Decade
	10 GΩ	0.1 % of reading	Comparison to Certified Leeds Northrup 4232B Bridge, 10 GΩ Fixed Point Reference
	100 GΩ	0.21 % of reading	Comparison to Fluke 5730A Multifunction Calibrator, Agilent 3458A Multimeter, 100 GΩ Standard, 1 MΩ Standard
Resistance Ranges (Measure) [1]	(50 to 100) μΩ 100 μΩ to 1 mΩ	0.006 μΩ – 60.4 μΩ/Ω 6.3 μΩ/Ω	Comparison to Guildline 9975 Comparator /9923 Extender
Resistance Ranges and Fixed Points (Measure) [1]	(1 to 10) mΩ	-0.002 μΩ + 5.6μΩ/Ω	Comparison to Guildline 9975A Comparator Leeds & Northrup 4300 Milliohm Standard
	(10 to 100) mΩ	0.029 μΩ + 5.8 μΩ/Ω	Comparison to Guildline 9975 Comparator /9923 Extender
	100 mΩ to 1 Ω (1 to 10) Ω	1.1 μΩ + 14 μΩ/Ω 9.9μΩ + 2.3 μΩ/Ω	Comparison to Agilent 3458A Multimeter, 1 Ω Fixed Point
	(10 to 100) Ω	90 μΩ + 1.7 μΩ/Ω	Comparison to ESI RS925D Decade Resistor Agilent 3458A Multimeter 100 Ω Fixed Point
	100 Ω to 1 kΩ	44 μΩ + 2.1 μΩ/Ω	Comparison to ESI RS925D Decade Resistor Agilent 3458A Multimeter 1 kΩ Fixed Point
	(1 to 10) kΩ	350 μΩ + 2.5 μΩ/Ω	Comparison to ESI RS925D Decade Resistor Agilent 3458A Multimeter 10 kΩ Fixed Point

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Ranges and Fixed Points (Measure) [1]	(10 to 100) kΩ	3 mΩ + 2.9 μΩ/Ω	Comparison to ESI RS925D Decade Resistor Agilent 3458A Multimeter 100 kΩ Fixed Point
	100 kΩ to 1 MΩ	140 mΩ + 3.9 μΩ/Ω	Comparison to ESI RS925D Decade Resistor Agilent 3458A Multimeter 1 MΩ Fixed Point
	(1 to 10) MΩ	6.8 Ω + 7.0 μΩ/Ω	Comparison to PPM R3-1111 Decade Resistor Agilent 3458A Multimeter 10 MΩ Fixed Point
	(10 to 100) MΩ	250 Ω + 59 μΩ/Ω	Comparison to PPM R3-1111 Decade Resistor Agilent 3458A Multimeter 100 MΩ Fixed Point
Resistance Ranges (Measure) [1]	100 MΩ to 1 GΩ	-0.014 Ω + 290 μΩ/Ω	Comparison to PPM R3-1111 Decade Resistor Leeds & Northrup 4232B Bridge
Electrical Calibration of RTD Indicators [1]	(-200 to 0) °C (0 to 130) °C (130 to 600) °C (600 to 849) °C	0.01 °C 0.02 °C 0.12 °C 0.16 °C	Comparison to Resistance Decade, RTD Tables
AC Voltage (Source) [1]	1 mV 50 Hz to 1 kHz (>1 to10) mV 50 Hz to 1 kHz (>10 to 100) mV 50 Hz to 1 kHz	0.25 % of reading 120 μV/V 46 μV/V	Comparison to Ratio Transformer
AC Voltage (Source) [1]	(0.22 to 2.2) mV (10 to 20) Hz (0.22 to 2.2) mV (20 to 40) Hz (0.22 to 2.2) mV (40 to 20 000) Hz (0.22 to 2.2) mV (20 to 50) kHz (0.22 to 2.2) mV (50 to 100) kHz	0.24 μV/mV + 4 μV 0.091 μV/mV + 4 μV 0.08 μV/mV + 4 μV 0.2 μV/mV + 4 μV 0.5 μV/mV + 5 μV	Comparison to Fluke 5730A Multifunction Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage (Source) [1]	(0.22 to 2.2) mV (100 to 300) kHz	1 µV/mV + 10 µV	Comparison to Fluke 5730A Multifunction Calibrator
	(0.22 to 2.2) mV (300 to 500) kHz	1.4 µV/mV + 20 µV	
	(0.22 to 2.2) mV (500 to 1 000) kHz	2.7 µV/mV + 20 µV	
	(2.2 to 22) mV (10 to 20) Hz	0.24 µV/mV + 4 µV	
	(2.2 to 22) mV (20 to 40) Hz	0.09 µV/mV + 4 µV	
	(2.2 to 22) mV (40 to 20 000) Hz	0.08 µV/mV + 4 µV	
	(2.2 to 22) mV (20 to 50) kHz	0.2 µV/mV + 4 µV	
	(2.2 to 22) mV (50 to 100) kHz	0.5 µV/mV + 5 µV	
	(2.2 to 22) mV (100 to 300) kHz	1.1 µV/mV + 10 µV	
	(2.2 to 22) mV (300 to 500) kHz	1.4 µV/mV + 20 µV	
AC Voltage (Source) [1]	(2.2 to 22) mV (500 to 1 000) kHz	2.7 µV/mV + 20 µV	Comparison to Fluke 5730A Multifunction Calibrator
	(22 to 220) mV (10 to 20) Hz	0.24 µV/mV + 12 µV	
	(22 to 220) mV (20 to 40) Hz	0.09 µV/mV + 7 µV	
	(22 to 220) mV (40 to 20 000) Hz	0.057 µV/mV + 7 µV	
	(22 to 220) mV (20 to 50) kHz	0.12 µV/mV + 7 µV	
	(22 to 220) mV (50 to 100) kHz	0.31 µV/mV + 17 µV	
	(22 to 220) mV (100 to 300) kHz	0.65 µV/mV + 20 µV	
	(22 to 220) mV (300 to 500) kHz	1.4 µV/mV + 25 µV	
	(22 to 220) mV (500 to 10 00) kHz	2.7 µV/mV + 45 µV	
	(0.22 to 2.2) V (10 to 20) Hz	0.24 mV/V + 0.04 mV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage (Source) [1]	(0.22 to 2.2) V (20 to 40) Hz	0.09 mV/V + 0.015 mV	Comparison to Fluke 5730A Multifunction Calibrator
	(0.22 to 2.2) V (40 to 20 000) Hz	0.042 mV/V + 0.008 mV	
	(0.22 to 2.2) V (20 to 50) kHz	0.067 mV/V + 0.01 mV	
	(0.22 to 2.2) V (50 to 100) kHz	0.085 mV/V + 0.03 mV	
	(0.22 to 2.2) V (100 to 300) kHz	0.31 mV/V + 0.14 mV	
	(0.22 to 2.2) V (300 to 500) kHz	1 mV/V + 0.2 mV	
	(0.22 to 2.2) V (500 to 10 00) kHz	1.7 mV/V + 0.3 mV	
	(2.2 to 22) V (10 to 20) Hz	0.24 mV/V + 0.4 mV	
	(2.2 to 22) V (20 to 40) Hz	0.09 mV/V + 0.15 mV	
	(2.2 to 22) V (40 to 20 000) Hz	0.042 mV/V + 0.05 mV	
AC Voltage (Source) [1]	(2.2 to 22) V (20 to 50) kHz	0.067 mV/V + 0.1 mV	Comparison to Fluke 5730A Multifunction Calibrator
	(2.2 to 22) V (50 to 100) kHz	0.083 mV/V + 0.2 mV	
	(2.2 to 22) V (100 to 300) kHz	0.25 mV/V + 0.6 mV	
	(2.2 to 22) V (300 to 500) kHz	1 mV/V + 2 mV	
	(2.2 to 22) V (500 to 10 00) kHz	1.5 mV/V + 3.2 mV	
	(22 to 220) V (10 to 20) Hz	0.24 mV/V + 4 mV	
	(22 to 220) V (20 to 40) Hz	0.09 mV/V + 1.5 mV	
	(22 to 220) V (40 to 20 000) Hz	0.052 mV/V + 0.6 mV	
	(22 to 220) V (20 to 50) kHz	0.08 mV/V + 1 mV	
	(22 to 220) V (50 to 100) kHz	0.15 mV/V + 2.5 mV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage (Source) [1]	(0.25 V to 0.5) V 10 Hz	150 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Holt 6A Thermal Transfer Standard
	(0.25 to 0.5) V 20 Hz	70 μV/V	
	(0.25 to 0.5) V 50 Hz to 50 kHz	65 μV/V	
	(0.25 to 0.5) V 50 kHz to 100 kHz	70 μV/V	
	(0.25 to 0.5) V 100 kHz to 500 kHz	225 μV/V	
	(0.25 to 0.5) V 500 kHz to 1 MHz	750 μV/V	
	(>0.5 to 1) V 10 Hz	135 μV/V	
	(>0.5 to 1) V 20 Hz	65 μV/V	
	(>0.5 to 1) V 50 Hz to 1 kHz	55 μV/V	
	(>0.5 to 1) V 1 kHz to 10 kHz	45 μV/V	
AC Voltage (Source) [1]	(>0.5 to 1) V 10 kHz to 50 kHz	40 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Holt 6A Thermal Transfer Standard
	(>0.5 to 1) V 50 kHz to 100 kHz	50 μV/V	
	(>0.5 to 1) V 100 kHz to 500 kHz	150 μV/V	
	(>0.5 to 1) V 500 kHz to 1 MHz	625 μV/V	
	(>1 to 10) V 10 Hz	125 μV/V	
	(>1 to 10) V 20 Hz	50 μV/V	
	(>1 to 10) V 50 Hz to 20 kHz	30 μV/V	
	(>1 to 10) V 20 kHz to 50 kHz	40 μV/V	
	(>1 to 10) V 50 kHz to 100 kHz	50 μV/V	
	(>1 to 10) V 100 kHz to 500 kHz	150 μV/V	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage (Source) [1]	(>1 to 10) V 500 kHz to 1 MHz	625 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Holt 6A Thermal Transfer Standard
	(>10 to 50) V 10 Hz	125 μV/V	
	(>10 to 50) V 20 Hz	50 μV/V	
	(>10 to 50) V 50 Hz to 20 kHz	30 μV/V	
	(>10 to 50) V 20 Hz to 50 kHz	40 μV/V	
	(>10 to 50) V 50 Hz to 100 kHz	50 μV/V	
	(>10 to 50) V 100 Hz to 200 kHz	150 μV/V	
	(>50 to 100) V 10 Hz	125 μV/V	
	(>50 to 100) V 20 Hz	50 μV/V	
	(>50 to 100) V 50 Hz to 20 kHz	30 μV/V	
AC Voltage (Source) [1]	(>50 to 100) V 20 kHz to 50 kHz	40 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Holt 6A Thermal Transfer Standard
	(>50 to 100) V 50 kHz to 100 kHz	50 μV/V	
	(>100 to 150) V 10 Hz	125 μV/V	
	(>100 to 150) V 20 Hz	50 μV/V	
	(>100 to 150) V 50 Hz to 1 kHz	30 μV/V	
	(>100 to 150) V 1 kHz to 10 kHz	40 μV/V	
	(>100 to 150) V 10 kHz to 20 kHz	50 μV/V	
	(>100 to 150) V 20 kHz to 50 kHz	65 μV/V	
	(>100 to 150) V 50 kHz to 100 kHz	100 μV/V	
	(>150 to 300) V 10 Hz	125 μV/V	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage (Source) [1]	(>150 to 300) V 20 Hz	50 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Holt 6A Thermal Transfer Standard
	(>150 to 300) V 50 Hz to 1 kHz	30 μV/V	
	(>150 to 300) V 1 kHz to 10 kHz	40 μV/V	
	(>150 to 300) V 10 kHz to 20 kHz	50 μV/V	
	(>150 to 300) V 20 kHz to 50 kHz	65 μV/V	
	(>300 to 500) V 10 Hz	125 μV/V	
	(>300 to 500) V 20 Hz	50 μV/V	
	(>300 to 500) V 50 Hz to 1 kHz	35 μV/V	
	(>300 to 500) V 1 kHz to 10 kHz	60 μV/V	
	(>300 to 500) V 10 kHz to 20 kHz	90 μV/V	
	(>300 to 500) V 20 kHz to 50 kHz	110 μV/V	
AC Voltage (Source) [1]	(>500 to 1 200) V 10 Hz	125 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Holt 6A Thermal Transfer Standard
	(>500 to 1 200) V 20 Hz	50 μV/V	
	(>500 to 1 200) V 50 Hz to 1 kHz	40 μV/V	
	(>500 to 1 200) V 1 kHz to 10 kHz	60 μV/V	
	(>500 to 1 200) V 10 kHz to 20 kHz	120 μV/V	
	(>500 to 1 200) V 20 kHz to 50 kHz	145 μV/V	
AC Voltage (Measure) [1]	1 mV 50 Hz to 1 kHz	0.26 % of reading	Comparison to Ratio Transformer
	(>1 to 10) mV 50 Hz to 1 kHz	120 μV/V	
	(>10 to 100) mV 50 Hz to 1 kHz	49 μV/V	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage (Measure) [1]	(>10 to 100) mV 1 kHz to 20 kHz	0.002 3 mV + 0.000 17 mV/mV	Comparison to Agilent 3458A Multimeter
	(>10 to 100) mV 20 kHz to 50 kHz	0.002 9 mV + 0.000 34 mV/mV	
	(>10 to 100) mV 50 kHz to 100 kHz	0.013 mV – 0.000 13 mV/mV	
AC Voltage (Measure) [1]	0.25 V to 0.5 V 10 Hz	150 μV/V	Comparison to Holt 6A Thermal Transfer Standard
	0.25 V to 0.5 V 20 Hz	70 μV/V	
	(0.25 to 0.5) V 50 Hz to 50 kHz	65 μV/V	
	(0.25 to 0.5) V 50 kHz to 100 kHz	70 μV/V	
	(0.25 to 0.5) V 100 kHz to 500 kHz	225 μV/V	
	(0.25 to 0.5) V 500 kHz to 1 MHz	750 μV/V	
	(>0.5 to 1) V 10 Hz	135 μV/V	
AC Voltage (Measure) [1]	(>0.5 to 1) V 20 Hz	65 μV/V	Comparison to Holt 6A Thermal Transfer Standard
	(>0.5 to 1) V 50 Hz to 1 kHz	55 μV/V	
	(>0.5 to 1) V 1 kHz to 10 kHz	45 μV/V	
	(>0.5 to 1) V 10 kHz to 50 kHz	40 μV/V	
	(>0.5 to 1) V 50 kHz to 100 kHz	50 μV/V	
	(>0.5 to 1) V 100 kHz to 500 kHz	150 μV/V	
	(>0.5 to 1) V 500 kHz to 1 MHz	625 μV/V	
	(>1 to 10) V 10 Hz	125 μV/V	
	(>1 to 10) V 20 Hz	50 μV/V	
	(>1 to 10) V 50 Hz to 20 kHz	30 μV/V	

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 20 kHz to 50 kHz	40 μV/V	Comparison to Holt 6A Thermal Transfer Standard
	(>1 to 10) V 50 kHz to 100 kHz	50 μV/V	
	(>1 to 10) V 100 kHz to 500 kHz	150 μV/V	
	(>1 to 10) V 500 kHz to 1 MHz	625 μV/V	
	(>10 to 50) V 10 Hz	125 μV/V	
	(>10 to 50) V 20 Hz	50 μV/V	
	(>10 to 50) V 50 Hz to 20 kHz	30 μV/V	
	(>10 to 50) V 20 Hz to 50 kHz	40 μV/V	
	(>10 to 50) V 50 Hz to 100 kHz	50 μV/V	
	(>10 to 50) V 100 Hz to 200 kHz	150 μV/V	
AC Voltage (Measure) [1]	(>50 to 100) V 10 Hz	125 μV/V	Comparison to Holt 6A Thermal Transfer Standard
	(>50 to 100) V 20 Hz	50 μV/V	
	(>50 to 100) V 50 Hz to 20 kHz	30 μV/V	
	(>50 to 100) V 20 kHz to 50 kHz	40 μV/V	
	(>50 to 100) V 50 kHz to 100 kHz	50 μV/V	
	(>100 to 150) V 10 Hz	125 μV/V	
	(>100 to 150) V 20 Hz	50 μV/V	
	(>100 to 150) V 50 Hz to 1 kHz	30 μV/V	
	(>100 to 150) V 1 kHz to 10 kHz	40 μV/V	
	(>100 to 150) V 10 kHz to 20 kHz	50 μV/V	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage (Measure) [1]	(>100 to 150) V 20 kHz to 50 kHz	65 μV/V	Comparison to Holt 6A Thermal Transfer Standard
	(>100 to 150) V 50 kHz to 100 kHz	100 μV/V	
	(>150 to 300) V 10 Hz	125 μV/V	
	(>150 to 300) V 20 Hz	50 μV/V	
	(>150 to 300) V 50 Hz to 1 kHz	30 μV/V	
	(>150 to 300) V 1 kHz to 10 kHz	40 μV/V	
	(>150 to 300) V 10 kHz to 20 kHz	50 μV/V	
	(>150 to 300) V 20 kHz to 50 kHz	65 μV/V	
	(>300 to 500) V 10 Hz	125 μV/V	
	(>300 to 500) V 20 Hz	50 μV/V	
AC Voltage (Measure) [1]	(>300 to 500) V 50 Hz to 1 kHz	35 μV/V	Comparison to Holt 6A Thermal Transfer Standard
	(>300 to 500) V 1 kHz to 10 kHz	60 μV/V	
	(>300 to 500) V 10 kHz to 20 kHz	90 μV/V	
	(>300 to 500) V 20 kHz to 50 kHz	110 μV/V	
	(>500 to 1 200) V 10 Hz to 50 kHz	125 μV/V	
	(>500 to 1 200) V 20 Hz	50 μV/V	
	(>500 to 1 200) V 50 Hz to 1 kHz	40 μV/V	
	(>500 to 1 200) V 1 kHz to 10 kHz	60 μV/V	
	(>500 to 1 200) V 10 kHz to 20 kHz	0.12 mV/V	
	(>500 to 1 200) V 20 kHz to 50 kHz	0.15 mV/V	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC High Voltage (Source)	(>1 to 5) kV 60 Hz	-0.11 V + 5 V/kV	Comparison to AR 3605 Hypot, Ohm-Labs KV30A Divider, Agilent 34411A Multimeter
AC High Voltage (Measure)	(>1 to 5) kV 60 Hz	-0.11V + 5 V/kV	Comparison to Ohm-Labs KV30A Divider, Agilent 34411A Multimeter
AC High Voltage (Measure)	(>5 to 10) kV 60 Hz (>10 to 20) kV 60Hz	1.1 V + 4.7 V/kV 0.021 kV + 0.004 2 kV/kV	Comparison to Ohm-Labs KV30A Divider, Agilent 34411A Multimeter
	(>20 to 60) kV 60Hz	0.018 kV + 0.006 7 kV/kV	Comparison to Hipotronics KVM 200 Meter, Agilent 34411A Multimeter
DC Voltage Fixed Point (Source)	10 mV 100 mV 1 V 10 V	19 μV/V 2.6 μV/V 1.1 μV/V 1 μV/V	Comparison to Fluke 732A DC Reference Standard 752A Reference Divider
DC Voltage Ranges (Source) [1]	100 V 1 000 V	1.1 μV/V 1.4 μV/V	Comparison to Fluke 732A DC Reference Standard 752A Reference Divider
DC Voltage Ranges (Source) [1]	(0 to <10) μV	9.7 nV + 460 μV/V	Comparison to Keithley 262 Low Thermal Divider Fluke 5730A Multifunction Calibrator Agilent 3458A Multimeter 1 V Fixed Point
	(10 to <100) μV	3.7 nV + 130 μV/V	
	(100 to <1 000) μV	29 nV + 85 μV/V	
DC Voltage Ranges (Source) [1]	(1 to <10) mV	6 nV + 20 μV/V	Comparison to Keithley 262 Low Thermal Divider Fluke 5730A Multifunction Calibrator, Agilent 3458A Multimeter, Keithley 182 Voltmeter, 10 V Fixed Point

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage Ranges (Source) [1]	(10 to <100) mV (100 to <1 000) mV	0.18 nV + 0.34 μV/V 0.14 nV + 0.9 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Fluke 752A Reference Divider, Agilent 3458A Multimeter, 1 V Fixed Point, 10 V Fixed Point
DC Voltage Ranges (Source) [1]	(1 to <10) V	0.38 μV + 0.99 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Agilent 3458A Multimeter, 1 V Fixed Point, 10 V Fixed Point
DC Voltage Ranges (Source) [1]	(10 to <100) V (100 to 1 000) V	1 μV + 1.1 μV/V -13 μV + 1.4 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Fluke 752A Reference Divider, Agilent 3458 Multimeter, 1 V Fixed Point, 10 V Fixed Point
DC High Voltage (Source)	(>1 to 5) kV	-0.037 V + 0.62 mV/V	Comparison to Extech 7021 Hipot, Ohm-Labs KV30A Divider, Agilent 34411A Multimeter
DC High Voltage (Source)	(>5 to 10) kV	-3.3 V + 1.3 mV/V	Comparison to AN/GSM-6B HV Source, Ohm-Labs KV30A Divider, Agilent 34411A Multimeter
DC High Voltage (Source)	(>10 to 30) kV	-9.4 V + 1.5 mV/V	Comparison to AN/GSM-6B HV Source Ohm-Labs KV30A Agilent 34411A Multimeter
DC High Voltage (Source)	(>30 to 50) kV (>50 to 70) kV	0.034 kV + 5.5 mV/V -0.03 kV + 6.8 mV/V	Comparison to AN/GSM-6B HV Source Hipotronics KVM200 Meter, Agilent 34411A Multimeter, 1 MΩ Shunt
DC Voltage Fixed Point (Measure)	100 mV 1 V 10 V 100 V 1 000 V	2.6 μV/V 1.1 μV/V 1 μV/V 1.1 μV/V 1.4 μV/V	Comparison to Fluke 732A DC Reference Standard, 752A Reference Divider

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage Ranges (Measure) [1]	(1 to 10) mV	0.18 μV + 9.1 μV/V	Comparison to Keithley 182 Voltmeter, 10 mV Fixed Point
	(10 to 100) mV	0.18 μV + 0.34 μV/V	Comparison to Agilent 3458A Multimeter, 100 mV Fixed Point
DC Voltage Ranges (Measure) [1]	(100 to 1 000) mV	0.14 μV + 0.92 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Agilent 3458 Multimeter, 1 V Fixed Point, 10 V Fixed Point Fluke 752A Reference Divider
DC Voltage Ranges (Measure) [1]	(1 to 10) V	0.38 μV + 0.99 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Agilent 3458 Multimeter, 1 V Fixed Point, 10 V Fixed Point
DC Voltage Ranges (Measure) [1]	(10 to 100) V	1 μV + 1.1 μV/V	Comparison to Fluke 5730A Multifunction Calibrator, Agilent 3458 Multimeter, 1 V Fixed Point, 10 V Fixed Point Fluke 752A Reference Divider
	(100 to 1 000) V	-13 μV + 1.4 μV/V	
DC High Voltage (Measure)	(>1 to 5) kV	-0.037V + 0.62 mV/V	Comparison to Extech 7021 Hipot, Ohm-Labs KV30A Divider, Agilent 34411A Multimeter
	(>5 to 10) kV (>10 to 30) kV	-3.3V + 1.3 mV/V -9.4 V + 1.5 mV/V	Comparison to AN/GSM-6B HV Source, Ohm-Labs KV30A Divider, Agilent 34411A Multimeter
	(>30 to 50) kV (>50 to 100) kV	0.34 kV + 5.5 mV/V -0.049 kV + 7.2 mV/V	Comparison to AN/GSM-6B HV Source, Hipotronics KVM200 Meter Agilent 34411A Multimeter, 1 MΩ Shunt

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Ratio (Source)	(0 to 0.1) ratio (0.1 to 1) ratio	0.28 μV/V + (0.22 μV/V of input X ratio) 0.6 μV/V of input ratio	Comparison to Fluke 720A Kelvin Varley Divider
Thermocouple Simulation [1]	Type B (250 to 350) °C (350 to 445) °C (445 to 580) °C (580 to 750) °C (750 to 1 000) °C (1 000 to 1 820) °C	 1.1 °C 0.86 °C 0.68 °C 0.54 °C 0.45 °C 0.36 °C	Comparison to Ectron 1140A Thermocouple Simulator
	Type E (-270 to -245) °C (-245 to -195) °C (-195 to -155) °C (-155 to -90) °C (-90 to 15) °C (15 to 890) °C (890 to 1 000) °C	 1.4 °C 0.21 °C 0.12 °C 0.097 °C 0.086 °C 0.072 °C 0.086 °C	
Thermocouple Simulation [1]	Type J (-210 to -180) °C (-180 to -120) °C (-120 to -50) °C (-50 to 1 200) °C	 0.14 °C 0.12 °C 0.098 °C 0.087 °C	Comparison to Ectron 1140A Thermocouple Simulator
	Type K (-270 to -255) °C (-255 to -195) °C (-195 to -115) °C (-115 to -55) °C (-55 to 1 000) °C (1 000 to 1 372) °C	 2.5 °C 0.81 °C 0.14 °C 0.11 °C 0.089 °C 0.1 °C	
	Type N (-270 to -260) °C (-260 to -200) °C (-200 to -140) °C (-140 to -70) °C (-70 to 25) °C (25 to 160) °C (160 to 1 300) °C	 5.8 °C 1.2 °C 0.27 °C 0.18 °C 0.14 °C 0.12 °C 0.11 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
	Type R (-50 to -30) °C (-30 to 45) °C (45 to 160) °C (160 to 380) °C (380 to 775) °C (775 to 1 768) °C	 0.78 °C 0.67 °C 0.52 °C 0.41 °C 0.38 °C 0.34 °C	
	Type S (-50 to -30) °C (-30 to 0) °C (0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C (1 400 to 1 768) °C	 0.75 °C 0.68 °C 0.51 °C 0.44 °C 0.4 °C 0.37 °C	
Thermocouple Simulation [1]	Type T (-270 to -255) °C (-255 to -240) °C (-240 to -210) °C (-210 to -150) °C (-150 to -40) °C (-40 to 100) °C (100 to 400) °C	 2.1 °C 0.57 °C 0.35 °C 0.21 °C 0.14 °C 0.1 °C 0.089 °C	Comparison to Ectron 1140A Thermocouple Simulator
Oscilloscope Vertical Amplitude DC (1 MΩ)	(0 to 130) V (0 to 6.6) V	29 μV + 0.29 mV/V 46 μV + 0.29 mV/V	Comparison to Fluke 5800A Oscilloscope Calibrator
Square Wave (1 MΩ)	1 mV to 130 V pk-pk 10 Hz to 1 kHz 1 mV to 130 V pk-pk (1 to 10) kHz	230 μV + 0.59 mV/V pk-pk 53 μV + 2.9 mV/V pk-pk	Comparison to Fluke 5800A Oscilloscope Calibrator
Square Wave (50 Ω)	1 mV to 6 p 6 V pk-pk 10 Hz to 10 kHz	310 μV + 2.8 mV/V pk-pk	
Pulse Risetime	1 kHz to 10 MHz (200 to 350) ps	120 ps	
Time Mark Source (1-2-5)	2 ns to 20 ms 50 ms to 5 s	1.2 μs/s -32 ns + 3.5 μs/s	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Time Mark Source (non-cardinal)	2 ns to 5 s	58 μs/s	Comparison to Fluke 5800A Oscilloscope Calibrator
Leveled Sinewave (Source)	50 kHz to 10 MHz 5 mV to 5.5 V	35 μV + 42 mV/V	Comparison to Fluke 5800A Oscilloscope Calibrator
	(10 to 30) MHz 5 mV to 5.5 V	33 μV + 42 mV/V	
	(>30 to 100) MHz 5 mV to 5.5 V	73 μV + 42 mV/V	
	(>100 to 250) MHz 5 mV to 5.5 V	87 μV + 50 mV/V	
	(>250 to 500) MHz 5 mV to 5.5 V	100 μV + 68 mV/V	
	(>500 to 600) MHz 5 mV to 5.5 V	100 μV + 78 mV/V	
	600 MHz to 1 GHz 5 mV to 5.5 V	18 mV/V	
Input Resistance (Measure)	(40 to 60) Ω (500 to 1 500) kΩ	7.2 mΩ + 1.1 mΩ/Ω 17 Ω + 1.2 mΩ/Ω	Comparison to Fluke 5800A Oscilloscope Calibrator
Input Capacitance (Measure)	(5 to 50) pF	0.61 pF + 57 mF/F	

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power (Source)	1 mW @ 50 MHz	0.024 mW	Comparison to HP437B Power Meter
RF Power (Measure)	1 mW @ 50 MHz	0.019 mW	Comparison to HP 432A Power Meter Agilent 478A Thermistor Mount

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power (Absolute Measure)	0.1 nW to 10 μW (10 to 30) MHz 0.1 nW to 10 μW (30 to 50) MHz 0.1 nW to 10 μW 50 MHz to 2 GHz	0.000 003 3 μW + 0.035 μW/μW 0.000 003 5 μW + 0.032 μW/μW 0.000 003 5 μw + 0.032 μW/μW	Comparison to Agilent 437B Power Meter Agilent 8484A Power Sensor
RF Power (Absolute Measure)	0.1 nW to 10 μW (2 to 12.4) GHz 0.1 nW to 10 μW (12.4 to 18) GHz 1 μW to 100 mW 100 kHz to 1 MHz 1 μW to 100 mW (1 to 50) MHz 1 μW to 100 mW 50 MHz to 2 GHz 1 μW to 100 mW (2 to 4.2) GHz	0.000 003 4 μw + 0.032 μW/μW 0.000 003 3 μW + 0.034 μW/μW 0.000 037 mW + 37 mW/W 0.000 04 mW + 31 mW/W 0.000 04 mW + 31 mW/W 0.000 04 mW + 32 mW/W	Comparison to Agilent 437B Power Meter Agilent 8484A Power Sensor
RF Power (Absolute Measure)	(1 to 10) μW (4 to 10) GHz (10 to 30) μW (4 to 10) GHz	0.072 μW + 0.028 μW/μW 0.15 μW + 0.03 μW/μW	Comparison to HP 432A Power Meter HP 478A Thermistor Mount
RF Power (Absolute Measure)	(30 to 100) μW (4 to 10) GHz	0.47 μW + 0.03 μW/μW	Comparison to HP 432A Power Meter HP 478A Thermistor Mount
RF Power (Absolute Measure)	(100 to 300) μW (4 to 10) GHz (0.3 to 1) mW (4 to 10) GHz (1 to 3) mW (4 to 10) GHz (3 to 10) mW (4 to 10) GHz	1.5 μW + 0.03 μW/μW 0.004 7 mW + 30 mW/W 0.015 mW + 30 mW/W 0.044 mW + 30 mW/W	Comparison to HP 432A Power Meter HP 478A Thermistor Mount
RF Power (Relative Measure)	0.1 nW to 10 μW 10 MHz to 18 GHz 1 μW to 100 mW 100 kHz to 4.2 GHz	0.000 005 2 μW + 0.006 9 μW/μW 0.000 053 mW + 12 mW/W	Comparison to Agilent 437B Power Meter, Agilent 8484A Power Sensor

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Cylindrical Pins, Plugs & Thread Wires [2]	(0 to 12.7) mm (0.005 to 0.5) in	0.24 µm 9.6 µin	Comparison to PW LMU 175, Grade 0 Gage Blocks
Cylindrical Pins, Plugs & Thread Wires [2]	(12.7 to 330.2) mm (0.5 to 13.0) in	(0.33 + 0.000 11*l*) µm (13 + 0.11*L*) µin	Comparison to PW LMU 175, Grade 0 Gage Blocks
Spheres	(2.54 to 25.4) mm (0.1 to 1.0) in	(0.27 + 0.006 7*l*) µm (11 + 6.7*L*) µin	Comparison to PW LMU 175, Grade 0 Gage Blocks
Inside Micrometers [2]	(25.4 to 304.8) mm (1 to 12) in (304.8 to 609.6) mm (12 to 24) in (609.6 to 1 219.2) mm (24 to 48) in	(0.25+ 0.001 7*l*) µm (9.8 + 1.6*L*) µin (0.63 + 0.002 5*l*) µm (25 + 2.5L) µin (4.3 + 0.00067*l*) µm (170 +0.67*L*) µin	Comparison to PW LMU 175, PW 48”
End Measuring Rods [2] (Micrometer Standards)	(25.4 to 304.8) mm (1 to 12) in (304.8 to 609.6) mm (12 to 24) in (609.6 to 1 219.2) mm (24 to 48) in	(0.25+ 0.001 7*l*) µm (9.8 + 1.6*L*) µin (0.63 + 0.002 5*l*) µm (25 + 2.5L) µin (4.3 + 0.00067*l*) µm (170 +0.67*L*) µin	Comparison to PW LMU 175, PW 48”
Thickness Gages	(0.025 4 to 1.27) mm (0.001 to 0.05) in	0.23 µm 9 µin	Comparison to PW LMU 175
Steel Rules [2]	Up to 1 219.2 mm Up to 48 in	0.19 mm 0.007 5 in	Comparison to Steel Rule
Gage Blocks [2]	(0.203 to 1.27) mm (0.008 to 0.05) in	(0.099 + 0.000 063*l*) µm (3.9 + 0.063*L*) µin	Comparison to Comparator Grade 0 Blocks
Gage Blocks [2]	(1.27 to 101.6) mm (0.05 to 4.0) in	0.078 µm + 0.013 µm/mm 3.1 µin + 1.3 µin/in	Comparison to Comparator Grade 0 Blocks
	(101.6 to 500) mm (4 to 20) in	(0.97 + 0.002 6*l*) µm (38 + 2.6*L*) µin	Comparison to Comparator Master Blocks
Plain Ring Gages [2]	(1.016 to 3.175) mm (0.04 to 0.125) in (3.175 to 25.4) mm (0.125 to 1) in (25.4 to 355.6) mm (1 to 14) in	0.28 µm 11 µin 0.25 µm 10 µin (0.22 + 0.25l) µm (8.7 to 1.87L) µin	Comparison to PW LMU 175
Radius Gages [2]	(0.381 to 25.4) mm (0.015 6 to 1) in	0.001 5 mm + 0.035 % of reading 0.000 059 in + 0.035 % of reading	Comparison to Starrett Vision System

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers & Linear Scales [1,2]	(0 to 304.8) mm (0 to 12) in (304.8 to 1 524) mm (12 to 60) in	(12 + 0.000 92*l*) µm (480 + 0.92*L*) µin (15 + 0.001 4*l*) µm (590 + 1.4*L*) µin	Comparison to Gage Blocks
Tape Measures [2]	Up to 30.48 m Up to 100 ft	(0.031 + 0.000 23*l*) mm (0.001 2 + 0.000 23*L*) in	Comparison to Steel Rule
		(0.4 + 0.000 006 6*l*) mm (0.016 + 0.000 006 6*L*) in	Comparison to 50 ft Tape
Height Gages [2]	(25.4 to 1 016) mm (1 to 40) in	(0.044 + 0.002 5*l*) µm (1.7 + 2.5*L*) µin	Comparison to Gage Blocks, Surface Plate
Height Master & Riser Block [2]	(0 to 304.8) mm (0 to 12) in	(7.1 + 0.01*l*) µm (280 + 13*L*) µin	Comparison to Gage Blocks
Indicators, Digital, Dial & Test [1,2]	(0 to 101.6) mm (0 to 4) in	(2 + 0.004 3*l*) µm (79 + 4.3*L*) µin	Comparison to Indicator Checker
Micrometers, Outside, Depth, Bore Gages [1,2]	(2.54 to 101.6) mm (0.010 to 4) in	(1.4 + 0.002 4*l*) µm (57 + 2.5*L*) µin	Comparison to Gage Blocks
	(101.6 to 508) mm (4 to 24) in	(2.8 + 0.003 7*l*) µm (110 + 3.7*L*) µin	
Micrometers, High Accuracy [1]	(0 to 25.4) mm (0 to 1) in	0.14 µm + 0.003 7 µm/mm 5.5 µin + 3.9 µin/in	Comparison to Grade 0 Gage Blocks
Thread Micrometer Setting Standard	(1 to 6) in (25 to 150) mm	42 µin 1.1 µm	Comparison to PW LMU 175
Thread Plugs Pitch Diameter	(0 to 4) in (0 to 101.6) mm	(79 + 1.71 D) µin (2 + 0.001 7 D) µm	Comparison to PW LMU 175
Thread Plugs Major Diameter	(0 to 4) in (0 to 101.6) mm	(18 + 0.35 D) µin (0.46 + 0.00035 D) µm	Comparison to PW LMU 175
Bubble Levels Level Vial Setting	(50 to 609.6) mm (1.96 to 24) in	4.1 s Vial Setting	Comparison to Gage Blocks Surface Plate
Bubble Levels Vial Sensitivity	(50 to 609.6) mm (1.96 to 24) in	3.9 s Vial Sensitivity	
Digital Protractors & Inclinometers	(0 to 60) °	0.002 °	Comparison to Gage Blocks Surface Plate Sine Bar
	90 °	0.036 °	Comparison to Surface Plate Cylindrical Square

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Measuring Microscopes Linearity [1]	(0 to 101.6) mm (0 to 4 in)	5.1 µm 200 µin	Comparison to Gage Blocks
Angle	(0 to 90) °	2.6 min	Comparison to Angle Blocks
Profilometers & Surface Roughness Testers [1]	16 Ra 119 Ra	4.1 µin	Comparison to Roughness Standard
Optical Comparators Linearity [1]	(0 to 254) mm (0 to 10) in	4.1 µm 160 µin	Comparison to Gage Blocks
Angular Scales	90 °	36 s	Comparison to Angle Blocks
Surface Plates [1] Overall Flatness	Up to (6 x 6) ft	0.36 µin + 0.85 µin/in	Comparison to Laser
Surface Plates [1] Local Area Flatness (Repeat Reading)	Up to 0.001 in	30 µin	Comparison to Repeat-o-meter

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Air Speed Velocity (Anemometers, Pitot Tubes)	(1.5 to 30) m/s	0.009 m/s + 1.1 % of reading	Comparison to Pitot Tube Manometer
Air Flow	(10 to 375) SCFM	0.082 CFM + 0.44 % of reading	Comparison to Coriolis Flow Meter
Gas Flow (Mass & Volume Flow Meters) [1]	(30 to 400) SLPM	0.2 SLPM + 0.27 % of reading	Comparison to Bell Prover
Gas Flow (Mass & Volume Flow Meters) [1]	(0.1 to 35) SLPM (0 to 100) SCCM	0.002 SLPM + 0.13 % of reading 0.42 SCCM + 0.98 % of reading	Comparison to Piston Prover
Gas Flow (Balometers, Volume Flow Meters)	(200 to 2 000) SCFM	1.4 SCFM + 0.9 % of reading	Comparison to Laminar Flow Element
Liquid Flow [1]	(1 to 151) L/min	0.003 3 SLPM+ 0.12 % of reading	Comparison to Coriolis Flowmeter
	(0.1 to 60) L/h	0.004 1 L/h + 0.36 % of reading	Comparison to Time, Weight, Density Correction Applied

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Liquid Flow [1]	(1 to 226) L/min	0.003 1 SLPM + 0.14 % of reading	Comparison to Coriolis Flowmeter
Liquid Flow [1]	(39 to 1 556) L/min (0 to 400) gpm	0.12 /min + 0.57 % of reading 0.033 gpm + 0.57 % of reading	Comparison to Mag Meter
Force - Compression	(9.8 to 4 452) mN (1 to 454) grf (4.44 to 4 440) N (1 to 1 000) lbf	0.018 mN + 0.018 % of reading 0.0019 g + 0.018 % of reading 0.008 2 N + 0.016 % of reading 0.001 8 lbf + 0.016 % of reading	Comparison to Dead Weight
	(0.91 to 44.48) kN (204 to 10 000) lbf	9.4 N + 0.035 % of reading 2.1 lbf + 0.035 % of reading	Comparison to 10 000 lb 1000 Series Digital Proving Ring
	(2 to 89) kN (460 to 20 000) lbf	15 N + 0.013 % of reading 3 lbf + 0.001 1 % of reading	Comparison to 20 000 lb 1000 Series Digital Proving Ring
Force - Compression	(14.6 to 445) kN (3 284 to 100 000) lbf	69 N + 0.0 02 % of reading 16 lbf + 0.0 02 % of reading	Comparison to 100 000 lb 1000 Series Digital Proving Ring
Force - Tension	(9.8 to 4 452) mN (1 to 454) grf (4.44 to 4 440) N (1 to 1 000) lbf	0.018 mN + 0.018 % of reading 0.001 9 g + 0.018 % of reading 0.007 5 N + 0.02 % of reading 0.001 7 lbf + 0.02 % of reading	Comparison to Dead Weight
	(0.91 to 44.48) kN (204 to 10 000) lbf	9.4 N + 0.035 % of reading 2.1 lbf + 0.035 % of reading	Comparison to 10 000 lb 1000 Series Digital Proving Ring
	(2 to 89) kN (460 to 20 000) lbf	13 N + 0.001 1 N/N 3 lbf + 0.001 1 lbf/lbf	Comparison to 20 000 lb 1000 Series Digital Proving Ring
	(14.6 to 445) kN (3 284 to 100 000) lbf	26 N + 0.1 1 % of reading 5.9 lbf + 0.1 1 % of reading	Comparison to 100 000 lb 1000 Series Digital Proving Ring
LEEB Hardness Tester [1]	(576, 655, 576) HLD	12 HLD	Indirect Verification per ASTM 956A
Rockwell Hardness Testers [1]	HRC Low Medium High	0.45 HRC	Indirect Verification per ASTM E18
	HRBW Low Medium High	0.63 HRBW	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers [1]	HRA Low Medium High	0.55 HRA	Indirect Verification per ASTM E18
	HREW Low Medium High	0.44 HREW	
Weights	(0 to 3) g	5.6 μg + 0.004 4 mg/g	Comparison to Mettler M3 Balance Class 1 Weights
	(0 to 200) g	0.053 mg + 0.004 7 mg/g	Comparison to Sartorius ME215S Balance Class 1 Weights
	(0 to 5 000) g	4 mg + 0.002 mg/g	Comparison to Voland Scale Class 1 Weights
	200 g to 15 kg	9.4 mg + 0.006 1 mg/g	Comparison to Mettler KA10-3 Comparator Class 1 Weights
	(1 to 30) kg	17 mg + 0.004 8 mg/g	AND 30 Mass Comparator Class 1 Weights
	(10 to 50) kg	0.92 mg + 0.007 4 mg/g	Comparison to Mettler KA50-2/P Comparator Class 1 Weights
Vacuum [1]	(0.001 to 10) torr	0.003 7 torr	Comparison to Capacitance Manometer High Vacuum Pump Diffusion Pump
Pressure-Pneumatic Gage and Absolute Gage Only [1]	(18 to 1 000) psia (124 to 6 895) kPa (0.2 to 18.2) psia (1.37 to 124.1) kPa	0.002 3 % of reading 0.003 1 % of reading	Comparison to Ruska 2465 Deadweight Tester or Transducers [1]
Pressure, Hydraulic Gage [1]	(1 000 to 15 000) psi (6.894 to 103.42) MPa	0.006 7 % of reading	Comparison to Ruska 2485 Deadweight Tester or Portable Dead Weight Tester [1]
Manometers [1]	(0 to 20) inH2O	0.003 inH2O	Comparison to Meriam Micromanometer

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Manometers [1]	(0 to 2) inH2O	0.001 5 inH2O 0.04 mmH2O	Comparison to Dwyer Microtector
Precision Balances (Resolution 0.1 mg) [1]	(0 to 205) g	0.35 mg	Comparison to Standard Mass
Analytical Balances (Resolution 1 mg) [1]	(0 to 500) g	0.8 mg	
Analytical Balances (Resolution 10 mg) [1]	(0 to 3 200) g	8.1 mg	Comparison to Standard Mass
Bench Scales (Resolution 0.1 g) [1]	(0 to 32) kg	69 mg	
Floor Scales (Resolution 0.2 kg) [1]	(0 to 907) kg	0.11 kg	
Torque Analyzers	(0.1 to 2 712) N·m (0.1 to 2 000) lbf·ft	0.04 % of reading	Comparison to Torque Arm Weights
Torque Wrenches [1,2]	(0.05 to 5.6) N·m (0.5 to 50) lbf·in (5.6 to 22.6) N·m (50 to 200) lbf·in (20.3 to 135.6) N·m (15 to 100) lbf·ft	(0.001 8 + 0.002 7*T*) N·m (0.016 + 0.002 7*T*) lbf·in (0.005 + 0.002 7*T*) N·m (0.044 + 0.002 7*T*) lbf·in (0.025 + 0.002 8*T*) N·m (0.018 + 0.002 8*T*) lbf·ft	Comparison to Torque Calibrator
Torque Wrenches [1,2]	(135.6 to 2 711.6) N·m (100 to 2 000) lbf·ft	(0.21 + 0.002 8*T*) N·m (0.15 + 0.002 8*T*) lbf·ft	Comparison to Torque Calibrator
Torque Watches [1]	(2 to 17) N·m (0.5 to 2.5) ozf·in (8 to 70) N·m (2 to 10) ozf·in	0.1 N·m (0.014 ozf·in) 0.5 N·m (0.071 ozf·in)	Comparison to Torque Watch Calibrator
Torque Watches [1]	(42 to 303) N·m (6 to 43) ozf·in (211 to 1 518) N·m (30 to 215) ozf·in	1.6 N·m (0.22 ozf·in) 6.8 N·m (0.96 ozf·in)	Comparison to Torque Watch Calibrator
Viscometers	< 10 cP (10 to 100) cP (100 to 1 000) cP (1 000 to 10 000) cP (10 000 to 100 000) cP	0.3 % of reading 0.46 % of reading 0.5 % of reading 0.68 % of reading 0.71 % of reading	Comparison to Viscosity Standard Thermometer Water Bath

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Viscosity Cups	< 10 cSt (10 to 100) cSt (100 to 1 000) cSt	0.98 % of reading 1.7 % of reading 1.7 % of reading	Comparison to Viscosity Standard Thermometer Water Bath Stop Watch

Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Illuminance responsivity (Illuminant A – CIE) White Light Meters	Up to 2 000 fc (2 000 to 5 500) fc (5 500 to 14 400) fc Up to 21 527 lux (21 527 to 59 201) lux (59 201 to 155 000) lux (100 to 30 000) fL	1.7 % of reading 1.9% of reading 55 fc + 2.5% 1.7 % of reading 1.9% of reading 592 fc + 2.5% of reading 2.3 % of reading	Comparison to Radiometer White Light Detector
Spectral Irradiance UV-A (315 to 400) nm Black Light Meters	(100 to 2 000) $\mu W/cm^2$	5.8 % of reading	Comparison to Radiometer Black Light Detector
Photometric Sources: Correlated Color Temperature: Incandescent, Non-incandescent	(2 300 to 13 000) K	33 K	Comparison to Spectrophotometer

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity (Source)	(10 to 90) %RH	0.59 % RH + 0.058 % of reading	Comparison to Thunder 2500 Chamber
Humidity (Measure and Source) [1]	(10 to 90) %RH	1.4 %RH	Comparison to Vaisala HMP77B Humidity Probe, General Eastern C1 Humidity Generator

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Infrared Pyrometers	(35 to 50) °C (50 to 100) °C (100 to 350) °C (350 to 500) °C	0.51 °C 0.67 °C 1.7 °C 2.6 °C	Comparison to Fluke 4181 Calibrator ε= 0.9 to 1.0 λ = (8 to 14) µm
Temperature Uniformity [1] Type J Thermocouple	(-90 to 1 000) °C (-130 to 1 832) °F	1.2 °C + 0.059 % of reading 2.2 °F + 0.059 % of reading	Comparison to Datalogger w/ External CJC, Thermocouple
	(-90 to 250) °C (-130 to 482) °F	0.25 °C + 0.015 % of reading 0.45 °F + 0.015 % of reading	Comparison to Datalogger w/RTDs
Temperature Measure [1]	(-196 to -100) °C (-321 to -148) °F (-100 to 0) °C (-148 to 32) °F (0 to 660) °C (32 to 1 220) °F	0.04 °C 0.07 °F 0.012 °C + 0.065 % of reading 0.019 °F + 0.065 % of reading 0.012 °C + 0.000 7 % of reading 0.022 °F + 0.000 7 % of reading	Comparison to Fluke 1594A Super Thermometer Rosemount 162CE SPRT
Temperature Measuring Equipment [1]	-196 ±5 °C -321 ± 9 °F	0.04 °C 0.07 °F	Comparison to Fluke 1594A Super Thermometer, Rosemount 162CE SPRT, LN2 Dewar
Temperature Measuring Equipment [1]	(-100 to 70) °C (-148 to 158) °F	0.012 °C + 0.006 5 % of reading 0.019 °F + 0.006 5 % of reading	Comparison to Fluke 1594A Super Thermometer, Rosemount 162CE SPRT, Fluke 7013 Bath, Halocarbon
Temperature Measuring Equipment [1]	(60 to 300) °C (140 to 572) °F	0.012 °C + 0.001 1 % of reading 0.022 °F + 0.001 1 % of reading	Comparison to Fluke 1594A Super Thermometer, Rosemount 162CE SPRT, Fluke 7013 Bath, Silicone Oil
	(150 to 400) °C (302 to 770) °F	0.012 °C + 0.001 1 % of reading 0.022 °F + 0.001 1 % of reading	Comparison to Fluke 1594A Super Thermometer Rosemount 162CE SPRT Fluke 6045 Salt Bath
ITS 90 – Fixed Point	660 °C 1 220 °F	0.54 °C 0.97 °F	Comparison to Aluminum Freeze Point Thermocouple Indicator
Surface Temperature Measurement [1]	(0 to 250) °C (32 to 482) °F	1.3 °C 2.3 °F	Comparison to Fluke 741 Process Calibrator Type K Surface Probe
Precision Thermometry	-196 °C	10 mK	Comparison to SPRT

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Precision Thermometry	-38.834 4 °C	1.6 mK	Comparison to Mercury Triple Point Cell
Precision Thermometry	0.010 °C	0.97 mK	Comparison to Water Triple Point Cell
Precision Thermometry	29.764 6 °C	1.3 mK	Comparison to Gallium Melting Point Cell
Precision Thermometry	156.598 5 °C	2.1 mK	Comparison to Indium Freezing Point Cell
Precision Thermometry	231.928 °C	3.8 mK	Comparison to Tin Freezing Point Cell
Precision Thermometry	419.527 °C	7.0 mK	Comparison to SPRT
Precision Thermometry	660.323 °C	11 mK	Comparison to SPRT

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Time Interval	(0.1 to 5) ns (5 to 50) ns	1 % reading + 15 ps 0.5 % reading + 150 ps	Comparison to Tektronix 2465 Oscilloscope
	3.3 ns to 10^{10} s	2.5 x 10-9 Hz / Hz + 500 ps	Comparison to Fluke PM6681R Counter
Frequency (Measure)	10 Hz to 200 MHz (0.2 to 2) GHz (2 to 26) GHz	2.5 x 10^{-9} Hz/Hz 2.6 x 10^{-9} Hz/Hz 6.2 x 10^{-9} Hz/Hz	Comparison to Fluke PM6681R Counter
Frequency (Source)	10 Hz to 200 MHz (0.2 to 2) GHz	2.5 x 10^{-9} Hz/Hz 2.6 x 10^{-9} Hz/Hz	Comparison to Signal Generator monitored with Fluke PM6681R Counter
Stop Watches [1]	Up to 24 hr	0.058 s/day	Comparison to Helmut Klein 4500 Timometer
	(1 to 3 600) s	0.12 s	Comparison to Timer Counter
Tachometers (Contact) [1]	(5.76 to 4 189) rad/s (55 to 40 000) rpm	0.21 rad/s + 0.007 % of reading 0.2 rpm + 0.007 % of reading	Comparison to rpm Standard

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Tachometers (Contact) [1]	(100 to 1 000) ft/min	0.026 % of reading	Comparison to rpm Standard Standard Wheel
Tachometers (Non-contact) Strobo & Photo [1]	(0.62 to 10 472) rad/s (6 to 100 000) rpm	0.000 4 rad/s + 0.000 6 % of reading 0.003 8 rpm + 0.000 6 % of reading	Comparison to Function Generator
Rpm (Measure)	(6 to 100 000) rpm	1.2 rpm	Comparison to Optical Tachometer

DIMENSIONAL MEASUREMENT

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Linear	Up to 304.8 mm Up to 12 in	0.003 6 mm + 0.000 37 % of reading 0.000 14 in + 0.000 37 % of reading	Comparison to Starrett Vision System
Linear Measurement	(25.4 to 50 800) mm (1 to 2 000) in	0.45 µm + 0.57 µm/mm 18 µin + 0.57 µin/in	Comparison to Laser Measuring Machine

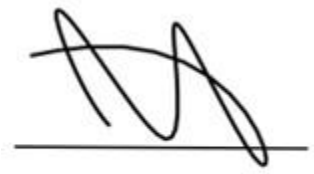
2 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Angular	(0 to 360) °	0.001 3 ° + 0.000 77 % of reading	Comparison to Starrett Vision System
Linear (2D)	(254 to 127) mm (10 x 5) in	0.003 6 mm + 0.000 37 % of reading 0.000 14 in + 0.000 37 % of reading	Comparison to Starrett Vision System

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. D = diameter in mm, DL = diagonal length in inches, fL = foot lambert, in$D$ = diagonal inches, l = length in mm, L = length in inches, mil = 1/1000 of an inch or 0.001 inch, T = applied torque.
3. Test currents up to 1000 A are generated using 50 turn coil with no loss of accuracy.
4. This scope is formatted as part of a single document including Certificate of Accreditation No. L2222
5. Chance Indiana Standards Laboratory dba Indiana Standards Laboratory.



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