



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

ARREGA TECNOLOGÍA, SAPI, DE CV
dba ARREGA INDUSTRIAL
Blvd. Tercera Oeste No. 17524, Fracc. Garita de Otay
Tijuana, Baja California Mexico

Fulfills the requirements of

ISO/IEC 17025:2017

and national standard

ANSI/NCSL Z540-1-1994 (R2002)

In the fields of

CALIBRATION and DIMENSIONAL MEASUREMENT

This certificate is valid only when accompanied by a current scope of accreditation document.
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Jason Stine, Vice President

Expiry Date: 07 September 2028
Certificate Number: ACT-2077



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)

ARREGA TECNOLOGÍA, SAPI, DE CV dba ARREGA INDUSTRIAL

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CALIBRATION AND DIMENSIONAL MEASUREMENT

ISO/IEC 17025 Accreditation Granted: 20 August 2026

Certificate Number: ACT-2077 Certificate Expiry Date: 07 September 2028

CALIBRATION

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters ⁵	4 pH 7 pH 10 pH	0.02 pH 0.027 pH 0.031 pH	Comparison to Accredited Buffer Solutions
Conductivity Meters ⁵	10 µS/cm 100 µS/cm 1 200 µS/cm 1 413 µS/cm	0.34 µS/cm 3 µS/cm 31 µS/cm 32 µS/cm	Comparison to Accredited Conductivity Solutions

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source ¹	(0 to 120) mV 120 mV to 1.2 V (1.2 to 12) V (12 to 120) V (120 to 1 020) V	9.5 µV/V + 0.62 µV 6.7 µV/V + 0.78 µV 6.4 µV/V + 7.8 µV 8.8 µV/V + 78 µV 8.7 µV/V + 0.78 mV	Comparison to Fluke 55xxA Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Measure ¹	(10 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	9.2 $\mu\text{V/V} + 0.3 \mu\text{V}$ 8 $\mu\text{V/V} + 0.3 \mu\text{V}$ 8 $\mu\text{V/V} + 0.5 \mu\text{V}$ 10 $\mu\text{V/V} + 30 \mu\text{V}$ 10 $\mu\text{V/V} + 0.1 \text{ mV}$	Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter
DC High Voltage – Measure ¹	Up to 5 kV (5 to 10) kV (10 to 20) kV (20 to 30) kV (30 to 40) kV (40 to 50) kV	80 $\mu\text{V/V} + 1.6 \text{ V}$ 80 $\mu\text{V/V} + 2.5 \text{ V}$ 80 $\mu\text{V/V} + 1.6 \text{ V}$ 80 $\mu\text{V/V} + 5.9 \text{ V}$ 0.1 $\text{mV/V} + 19 \text{ V}$ 0.1 $\text{mV/V} + 30 \text{ V}$	Comparison to Vitretek 4700 High Voltage Meter
DC Current – Source ¹	(0 to 120) mA (0.12 to 1.2) mA (1.2 to 12) mA (12 to 120) mA 120 mA to 1.2 A (1.2 to 3.1) A (3.1 to 12) A (12 to 30.2) A	97 $\mu\text{A/A} + 4.7 \text{ nA}$ 79 $\mu\text{A/A} + 12 \text{ nA}$ 79 $\mu\text{A/A} + 62 \text{ nA}$ 95 $\mu\text{A/A} + 0.62 \mu\text{A}$ 0.13 $\text{mA/A} + 7.8 \mu\text{A}$ 0.23 $\text{mA/A} + 7.8 \mu\text{A}$ 0.24 $\text{mA/A} + 0.19 \text{ mA}$ 0.78 $\text{mA/A} + 0.39 \text{ mA}$	Comparison to Fluke 55xxA Multiproduct Calibrator
DC Current Clamp Meters ¹	(20 to 60) A (60 to 1 000) A	0.28 % of reading + 15 mA 0.28 % of reading + 56 mA	Comparison to Fluke 55xxA Multiproduct Calibrator, Fluke 50-turn Coil
DC Current – Measure ¹	(0 to 100) μA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	20 $\mu\text{A/A} + 0.53 \text{ nA}$ 19 $\mu\text{A/A} + 3.3 \text{ nA}$ 20 $\mu\text{A/A} + 33 \text{ nA}$ 40 $\mu\text{A/A} + 0.33 \mu\text{A}$ 89 $\mu\text{A/A} + 6.7 \mu\text{A}$	Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter
DC Current – Measure ¹	Up to 18 A (18 to 30) A (30 to 650) A	6.6 $\mu\text{A/A} + 0.36 \text{ mA}$ 67 $\mu\text{A/A} + 0.71 \text{ mA}$ 1.9 $\text{mA/A} + 0.21 \text{ A}$	Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter, Empo B-1000-100 Shunt

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source ¹ (Simulation)	(0 to 12) Ω (> 12 to 120) Ω (> 0.12 to 1.2) k Ω (> 1.2 to 12) k Ω (12 to 120) k Ω (> 0.12 to 1.2) M Ω (1.2 to 12) M Ω (12 to 120) M Ω (0.12 to 1.2) G Ω	23 $\mu\Omega/\Omega$ + 0.78 m Ω 20 $\mu\Omega/\Omega$ + 0.78 m Ω 22 $\mu\Omega/\Omega$ + 1.6 m Ω 22 $\mu\Omega/\Omega$ + 16 m Ω 22 $\mu\Omega/\Omega$ + 0.16 Ω 22 $\mu\Omega/\Omega$ + 1.6 Ω 31 $\mu\Omega/\Omega$ + 23 Ω 0.34 m Ω/Ω + 1.9 k Ω 3.1 m Ω/Ω + 78 k Ω	Comparison to Fluke 55xxA Multiproduct Calibrator
Resistance – Source ¹ (Variable Artifact)	(1 to 10) Ω (10 to 100) Ω (100 to 1 000) Ω (1 to 10) k Ω (10 to 100) k Ω (100 to 1 000) k Ω (1 to 9) M Ω	0.92 m Ω/Ω 0.92 m Ω/Ω 0.92 m Ω/Ω 0.92 m Ω/Ω 0.92 m Ω/Ω 0.9 m Ω/Ω 0.93 m Ω/Ω	Comparison to General Radio 1433-33 Decade Resistor
Resistance – Measure ¹	(0 to 10) Ω (10 to 100) Ω (0.1 to 1) k Ω (1 to 10) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω	17 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 0.5 m Ω 12 $\mu\Omega/\Omega$ + 0.5 m Ω 12 $\mu\Omega/\Omega$ + 5 m Ω 13 $\mu\Omega/\Omega$ + 50 m Ω 17 $\mu\Omega/\Omega$ + 2 Ω 52 $\mu\Omega/\Omega$ + 0.1 k Ω 52 $\mu\Omega/\Omega$ + 0.1 k Ω 0.53 m Ω/Ω + 1 k Ω	Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter
AC Voltage – Source ¹	(1 to 12) mV (3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (12 to 120) mV (3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	1.9 mV/V + 5.4 μ V 0.69 mV/V + 5.4 μ V 0.2 mV/V + 4.7 μ V 0.34 mV/V + 4.7 μ V 1.2 mV/V + 12 μ V 6.2 mV/V + 23 μ V 1.9 mV/V + 5.4 μ V 0.68 mV/V + 5.4 μ V 0.11 mV/V + 4.7 μ V 0.28 mV/V + 6.2 μ V 0.62 mV/V + 16 μ V 1.6 mV/V + 23 μ V	Comparison to Fluke 55xxA Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source ¹	120 mV to 1.2 V		Comparison to Fluke 55xxA Multiproduct Calibrator
	(3 to 5) Hz	1.9 mV/V + 58 μ V	
	(5 to 10) Hz	0.68 mV/V + 54 μ V	
	10 Hz to 20 kHz	0.11 mV/V + 6.2 μ V	
	(20 to 50) kHz	0.23 mV/V + 11 μ V	
	(50 to 100) kHz	0.55 mV/V + 31 μ V	
	(100 to 500) kHz	1.5 mV/V + 62 μ V	
	(1.2 to 12) V		
	(3 to 5) Hz	1.9 mV/V + 0.58 mV	
	(5 to 10) Hz	0.68 mV/V + 0.58 mV	
	10 Hz to 20 kHz	0.11 mV/V + 39 μ V	
	(20 to 50) kHz	0.23 mV/V + 39 μ V	
	(50 to 100) kHz	0.55 mV/V + 97 μ V	
	(100 to 500) kHz	1.6 mV/V + 0.47 mV	
	(12 to 120) V		
	(3 to 5) Hz	1.9 mV/V + 5.8 mV	
	(5 to 10) Hz	0.68 mV/V + 5.8 mV	
	10 Hz to 20 kHz	0.11 mV/V + 0.39 mV	
	(20 to 50) kHz	0.26 mV/V + 0.39 mV	
	(50 to 100) kHz	0.56 mV/V + 0.97 mV	
	(100 to 300) kHz	1.6 mV/V + 16 mV	
	(120 to 330) V		
	(3 to 5) Hz	1.9 mV/V + 58 mV	
	(5 to 10) Hz	0.68 mV/V + 58 mV	
	10 Hz to 20 kHz	0.11 mV/V + 6.2 mV	
	(20 to 50) kHz	0.26 mV/V + 6.2 mV	
	(50 to 100) kHz	1.2 mV/V + 9.7 mV	
	(330 to 1 020) V		
	(3 to 5) Hz	1.9 mV/V + 58 mV	
	(5 to 10) Hz	0.68 mV/V + 58 mV	
	(10 to 10) kHz	0.11 mV/V + 62 mV	
AC Voltage – Measure ¹	Up to 10 mV		Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter
	40 Hz to 1 kHz	0.34 mV/V + 1.1 μ V	
	(1 to 20) kHz	0.42 mV/V + 1.1 μ V	
	(20 to 100) kHz	5.1 mV/V + 1.1 μ V	
	(100 to 300) kHz	41 mV/V + 2 μ 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		Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter
	40 Hz to 1 kHz	91 $\mu\text{V/V} + 2 \mu\text{V}$	
	(1 to 20) kHz	0.16 mV/V + 2 μV	
	(20 to 100) kHz	0.9 mV/V + 2 μV	
	(100 to 300) kHz	3.1 mV/V + 10 μV	
	(0.1 to 1) V		
	40 Hz to 1 kHz	86 $\mu\text{V/V} + 20 \mu\text{V}$	
	(1 to 20) kHz	0.16 mV/V + 20 μV	
	(20 to 50) kHz	0.33 mV/V + 20 μV	
	(50 to 100) kHz	0.83 mV/V + 20 μV	
	(100 to 300) kHz	3 mV/V + 0.1 mV	
	(300 to 500) kHz	10 mV/V + 0.1 mV	
	(1 to 10) V		
	(1 to 40) Hz	87 $\mu\text{V/V} + 0.4 \text{ mV}$	
	40 Hz to 1 kHz	85 $\mu\text{V/V} + 0.2 \text{ mV}$	
	(1 to 20) kHz	0.16 mV/V + 0.2 mV	
	(20 to 50) kHz	0.33 mV/V + 0.2 mV	
	(50 to 100) kHz	0.82 mV/V + 60 μV	
	(100 to 300) kHz	3 mV/V + 1 mV	
	(300 to 500) kHz	3.4 mV/V + 1 mV	
	500 kHz to 1 MHz	10 mV/V + 1 mV	
AC High Voltage – Measure ¹	(10 to 100) V		Comparison to Vitretek 4700 High Voltage Meter
	40 Hz to 1 kHz	0.22 mV/V + 2 mV	
	(1 to 20) kHz	0.23 mV/V + 2 mV	
	(20 to 50) kHz	0.38 mV/V + 2 mV	
	(50 to 100) kHz	1.3 mV/V + 2 mV	
	(100 to 1 000) V		
	(50 to 60) Hz	1 mV/V + 0.4 V	
	(60 to 100) Hz	25 mV/V + 0.4 V	
	Up to 9 kV		
	(50 to 60) Hz	1 mV/V + 0.4 V	
AC Current – Source ¹	Up to 120 μA		Comparison to Fluke 55xxA Multiproduct Calibrator
	(3 to 45) Hz	0.21 mA/A + 7.8 nA	
	> 45 Hz to 1 kHz	0.21 mA/A + 7.8 nA	
	(> 1 to 5) kHz	0.21 mA/A + 7.8 nA	
	(> 5 to 10) kHz	1.2 mA/A + 31 nA	
	(> 10 to 30) kHz	4 mA/A + 0.78 μA	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(> 0.12 to 1.2) mA		Comparison to Fluke 55xxA Multiproduct Calibrator
	(3 to 45) Hz	0.21 mA/A + 78 nA	
	> 45 Hz to 1 kHz	0.21 mA/A + 78 nA	
	(> 1 to 5) kHz	0.21 mA/A + 78 nA	
	(> 5 to 10) kHz	1.2 mA/A + 78 nA	
	(> 10 to 30) kHz	4 mA/A + 3.9 µA	
	(> 1.2 to 12) mA		
	(3 to 45) Hz	0.2 mA/A + 0.78 µA	
	> 45 Hz to 1 kHz	0.2 mA/A + 0.78 µA	
	(> 1 to 5) kHz	0.2 mA/A + 0.78 µA	
	(> 5 to 10) kHz	1.2 mA/A + 0.78 µA	
	(> 10 to 30) kHz	3.9 mA/A + 7.8 µA	
	(> 12 to 120) mA		
	(3 to 45) Hz	0.2 mA/A + 7.8 µA	
	> 45 Hz to 1 kHz	0.1 mA/A + 3.9 µA	
	(> 1 to 5) kHz	0.2 mA/A + 6.2 µA	
	(> 5 to 10) kHz	1.2 mA/A + 7.8 µA	
	(> 10 to 30) kHz	3.9 mA/A + 78 µA	
	(> 0.12 to 1.2) A		
	(3 to 45) Hz	0.2 mA/A + 78 µA	
	> 45 Hz to 1 kHz	0.2 mA/A + 39 µA	
	(> 1 to 5) kHz	0.2 mA/A + 62 µA	
	(> 5 to 10) kHz	1.9 mA/A + 0.23 mA	
	(> 10 to 30) kHz	3.9 mA/A + 0.23 mA	
	(> 1.2 to 3.1) A		
	(3 to 45) Hz	0.3 mA/A + 0.39 mA	
	> 45 Hz to 1 kHz	0.24 mA/A + 0.23 mA	
	(> 1 to 5) kHz	0.3 mA/A + 0.23 mA	
	(> 5 to 10) kHz	1.9 mA/A + 0.39 mA	
	(> 3.1 to 12) A		
	(3 to 45) Hz	0.3 mA/A + 0.78 mA	
	> 45 Hz to 1 kHz	0.24 mA/A + 0.39 mA	
	(> 1 to 5) kHz	0.31 mA/A + 0.62 mA	
	(> 5 to 10) kHz	1.9 mA/A + 0.78 mA	
	(> 12 to 30.2) A		
	(3 to 45) Hz	0.78 mA/A + 7.8 mA	
	> 45 Hz to 1 kHz	0.55 mA/A + 6.2 mA	
	(> 1 to 5) kHz	3.9 mA/A + 6.2 mA	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current Clamp Meters ¹	(20 to 50) A (45 to 65) Hz (65 to 100) Hz (> 50 to 500) A (45 to 65) Hz (65 to 100) Hz (> 500 to 1 000) A (45 to 65) Hz (65 to 100) Hz	0.3 % of reading + 20 mA 0.64 % of reading + 21 mA 0.28 % of reading + 72 mA 0.64 % of reading + 78 mA 0.29 % of reading + 0.39 A 0.65 % of reading + 0.32 A	Comparison to Fluke 55xxA Multiproduct Calibrator, Fluke 50-turn Coil
AC Current – Measure ¹	Up to 10 µA 1 kHz (10 to 100) µA 1 kHz (0.1 to 1) mA 1 kHz (1 to 10) mA 1 kHz (10 to 100) mA 1kHz (0.1 to 1) A 1 kHz	0.95 mA/A + 3 nA 0.62 mA/A + 30 nA 0.32 mA/A + 0.2 µA 0.32 mA/A + 2 µA 0.32 mA/A + 20 µA 1 mA/A + 0.2 mA	Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter
AC Current – Measure ¹	Up to 1 000 A (60 to 100) Hz	0.62 mA/A + 0.61 A	Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter, Empo B-1000-100 Current Shunt
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure ¹	Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 18 20) °C Type C (0 to 150) °C (150 to 650) °C (650 to 1 000) °C (1 000 to 1 800) °C (1 800 to 2 316) °C	0.52 °C 0.47 °C 0.36 °C 0.37 °C 0.33 °C 0.19 °C 0.22 °C 0.38 °C 0.63 °C	Comparison to Fluke 55xxA Multiproduct Calibrator

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 E		Comparison to Fluke 55xxA Multiproduct Calibrator
	(-250 to -100) °C	0.33 °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	0.2 °C	
	Type J		
	(-210 to -100) °C	0.22 °C	
	(-100 to -30) °C	0.16 °C	
	(-30 to 150) °C	0.15 °C	
	(150 to 760) °C	0.16 °C	
	(760 to 1 200) °C	0.2 °C	
	Type K		
	(-200 to -100) °C	0.26 °C	
	(-100 to -25) °C	0.17 °C	
	(-25 to 120) °C	0.16 °C	
	(120 to 1 000) °C	0.21 °C	
	(1 000 to 1 372) °C	0.31 °C	
	Type L		
	(-200 to -100) °C	0.27 °C	
	(-100 to 800) °C	0.2 °C	
	(800 to 900) °C	0.15 °C	
	Type N		
	(-200 to -100) °C	0.35 °C	
	(-100 to -25) °C	0.26 °C	
	(-25 to 120) °C	0.25 °C	
	(120 to 410) °C	0.25 °C	
	(410 to 1 300) °C	0.28 °C	
	Type R		
	(0 to 250) °C	0.57 °C	
	(250 to 400) °C	0.32 °C	
	(400 to 1 000) °C	0.31 °C	
	(1 000 to 1 767) °C	0.35 °C	
	Type S		
	(0 to 250) °C	0.4 °C	
	(250 to 1 000) °C	0.33 °C	
	(1 000 to 1 400) °C	0.34 °C	
	(1 400 to 1 767) °C	0.39 °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 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 0.23 °C 0.13 °C 0.12 °C 0.35 °C 0.12 °C	Comparison to Fluke 55xxA Multiproduct Calibrator
Electrical Simulation of RTD Indicating Devices – Source ¹	Pt 385, 100 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C Pt 385, 1 000 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C Pt 3916, 100 Ω (-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.039 °C 0.039 °C 0.056 °C 0.072 °C 0.08 °C 0.096 °C 0.18 °C 0.049 °C 0.066 °C 0.13 °C 0.16 °C 0.17 °C 0.19 °C 0.23 °C 0.29 °C 0.19 °C 0.032 °C 0.039 °C 0.048 °C 0.056 °C 0.064 °C 0.072 °C 0.081 °C 0.18 °C	Comparison to Fluke 55xxA Multiproduct Calibrator

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 3926, 100 Ω (-200 to -80) $^{\circ}\text{C}$ (-80 to 0) $^{\circ}\text{C}$ (0 to 100) $^{\circ}\text{C}$ (100 to 300) $^{\circ}\text{C}$ (300 to 400) $^{\circ}\text{C}$ (400 to 630) $^{\circ}\text{C}$	0.039 $^{\circ}\text{C}$ 0.039 $^{\circ}\text{C}$ 0.056 $^{\circ}\text{C}$ 0.072 $^{\circ}\text{C}$ 0.08 $^{\circ}\text{C}$ 0.096 $^{\circ}\text{C}$	Comparison to Fluke 55xxA Multiproduct Calibrator
Capacitance – Source ¹ (Simulation) 100 Hz to 10 kHz 150 Hz to 5 kHz 200 Hz to 1.3 kHz (2 to 310) Hz (0.5 to 110) Hz (0.5 to 40) Hz (0.1 to 11) Hz 30 mHz to 4 Hz 10 mHz to 1.3 Hz	(0.2 to 1.2) nF (1.21 to 12) nF (12 to 120) nF (0.12 to 1.2) μF (1.2 to 12) μF (12 to 120) μF (0.12 to 1.2) mF (1.2 to 12) mF (12 to 120) mF	0.16 % of reading + 3.1 pF 0.12 % of reading + 3.9 pF 0.12 % of reading + 23 pF 0.12 % of reading + 0.23 nF 0.12 % of reading + 2.3 nF 0.13 % of reading + 19 nF 0.2 % of reading + 0.19 μF 0.21 % of reading + 2.3 μF 0.4 % of reading + 23 μF	Comparison to Fluke 55xxA Multiproduct Calibrator
Capacitance – Source ¹ (Variable Artifact)	(10 to 100) pF (100 to 1 000) pF (1 to 10) nF (10 to 100) nF (100 to 1 000) nF	0.3 mF/F + 0.12 pF 0.9 mF/F + 0.074 pF 0.82 mF/F + 1.3 pF 0.89 mF/F + 4.9 pF 0.91 mF/F + 34 pf	Comparison to General Radio 1412-BC Decade Capacitor
Capacitance – Measure ¹	1 kHz (10 to 100) pF (100 to 1 000) pF (1 to 100) nF (0.1 to 1) μF	3.1 mF/F + 0.1 pF 3.1 mF/F + 1 pF 3.6 mF/F + 0.01 nF 2.5 mF/F + 0.1 nF	Comparison to Fluke PM6303 RCL Meter
Inductance – Source ¹ (Simulation) Up to 1 kHz Up to 1 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz	(15 to 120) μH (0.12 to 1.2) mH (1.2 to 12) mH (12 to 120) mH (0.12 to 1.2) H (1.2 to 12) H (12 to 120) H	0.22 % of reading + 0.16 μH 0.12 % of reading + 0.78 μH 0.12 % of reading + 7.8 μH 0.12 % of reading + 78 μH 0.14 % of reading + 0.78 mH 0.19 % of reading + 7.8 mH 0.22 % of reading + 78 mH	Comparison to Fluke 55xxA Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Inductance – Source ¹ (Fixed Artifacts)	100 Hz to 10 kHz 100 μ H 1 mH 100 mH	0.41 μ H 1.2 μ H 0.1 mH	Comparison to GenRad 1482B, 1482E, 1482L Standard Inductors
DC Power – Source ¹	Up to 3.1 kW (3.1 to 30) kW	0.025 % of reading + 9.9 mW 0.083 % of reading + 0.43 W	Comparison to Fluke 55xxA Multiproduct Calibrator
AC Power – Source ¹	45 Hz to 1 kHz Up to 120 W 120 W to 1.2 kW (1.2 to 3.2) kW (3.2 to 12) kW (12 to 30.8) kW (1 to 5) kHz Up to 120 W 120 W to 1.2 kW (1.2 to 3.2) kW (3.2 to 12) kW (12 to 30.8) kW	0.19 mW/W + 8.4 mW 0.23 mW/W + 84 mW 0.27 mW/W + 0.31 W 0.27 mW/W + 0.84 W 0.56 mW/W + 6.6 W 0.23 mW/W + 9.8 mW 0.23 mW/W + 98 mW 0.32 mW/W + 0.31 W 0.33 mW/W + 0.98 W 3.9 mW/W + 6.6 W	Comparison to Fluke 55xxA Multiproduct Calibrator
Phase Angle – Source ¹	(0 to 90)° Up to 400 Hz 400 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.2° 0.39° 1.9° 3.9° 7.8°	Comparison to Fluke 55xxA Multiproduct Calibrator
Oscilloscopes ¹ Amplitude Square Wave into 50 Ω load	1 kHz Up to 5 mV (5 to 11) mV (11 to 45) mV (45 to 110) mV (0.11 to 0.45) V (0.45 to 1.09) V	2.3 mV/V + 25 μ V 2 mV/V + 55 μ V 2 mV/V + 0.23 mV 2 mV/V + 0.55 mV 2 mV/V + 2.3 mV 2 mV/V + 5.5 mV	Comparison to Fluke 5502A/3 Multiproduct Calibrator with 300 MHz Scope Option

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes ¹ Leveled Sine Wave	10 Hz (1.09 to 2.2) V 100 Hz (1.09 to 2.2) V 1 kHz (1.09 to 2.2) V	1.9 mV/V + 22 mV 1.9 mV/V + 11 mV 2 mV/V + 11 mV	Comparison to Fluke 5502A/3 Multiproduct Calibrator with 300 MHz Scope Option
Amplitude Square Wave into 1 MΩ load	1 kHz Up to 5 mV (5 to 20) mV (20 to 89) mV (89 to 219) mV (219 to 890) mV (0.89 to 6.5) V	2.3 mV/V + 30 μV 2 mV/V + 0.1 mV 2 mV/V + 0.45 mV 1.9 mV/V + 1.1 mV 1.9 mV/V + 4.5 mV 1.9 mV/V + 33 mV	
	10 Hz (6.5 to 55) V	2 mV/V + 0.55 V	
	100 Hz (6.5 to 55) V	1.9 mV/V + 0.28 V	
	1 kHz (6.5 to 55) V	1.9 mV/V + 0.28 V	
	10 kHz (6.5 to 55) V	3.9 mV/V + 0.28 V	
Leveled Sine Wave Flatness (50 kHz Reference)	10 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz	28 mV/V + 0.23 mV/V 34 mV/V + 0.23 mV/V	
Time Marker into 50 Ω load	2 ns to 50 ms 50 ms to 5 s	20 μs/s 58 μs/s	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,2}	Up to 12 in (12 to 40) in (40 to 80) in	$(290 + 2.9L) \mu\text{in}$ $(200 + 9.6L) \mu\text{in}$ $(110 + 12L) \mu\text{in}$	Comparison to ASME Grade 0 Gage Blocks, Length Standards, Ring Gauges
Outside Micrometers ^{1,2}	Up to 12 in	$(35 + 9.8L) \mu\text{in}$	Comparison to ASME Grade 0 Gage Blocks, Length Standards
Inside Micrometers ^{1,2}	Up to 12 in (12 to 40) in	$(43 + 10L) \mu\text{in}$ $(170 + 8.8L) \mu\text{in}$	Comparison to ASME Grade 0 Gage Blocks, Length Standards, Ring Gauges
Dial Indicators ^{1,2}	Up to 4 in	$(27 + 7.4L) \mu\text{in}$	Comparison to ASME Grade 0 Gage Blocks
Test Indicators ^{1,2}	Up to 0.05 in	$(29 + 0.12L) \mu\text{in}$	Comparison to ASME Grade 0 Gage Blocks
Height Gages ^{1,2}	Up to 12 in (12 to 40) in	$(290 + 3.2L) \mu\text{in}$ $(330 + 6.5L) \mu\text{in}$	Comparison to ASME Grade 0 Gage Blocks, Length Standards, Surface Plate
Optical Comparators ^{1,2}	Up to 50 mm Up to 200 mm	$(0.73 + 0.25L) \mu\text{m}$ $(0.45 + 0.25L) \mu\text{m}$	Comparison to Mitutoyo Glass Scales
Microscopes ^{1,2}	Up to 50 mm Up to 2 in	$(0.73 + 0.25L) \mu\text{m}$ $(22 + 260L) \mu\text{in}$	Comparison to Mitutoyo Glass Scales
Protractor/Angle ^{1,2}	(30 to 90)°	1.8'	Comparison to Angle Block Set
Outside Diameter ²	(0.5 to 25) mm (25 to 60) mm	$(2.6 + 0.005D) \mu\text{m}$ $(9.3 - 0.039D) \mu\text{m}$	Direct measure using Laser Micrometer
Laser Micrometers ^{1,2}	(0.5 to 25) mm	0.3 μm	Cylindrical Plug Gages per ASME B.89.1.5-1998 Class XX
Laser Micrometers ^{1,2}	1 mm 60 mm	0.23 μm 0.5 μm	Comparison to Mitutoyo Calibration Gage, Set 02AGD170

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Blocks ²	Up to 2 in (2 to 4) in (4 to 6) in (6 to 12) in	$(3.4 + 1.3L) \mu\text{in}$ $(6 + 0.9L) \mu\text{in}$ $(9.6 + 0.5L) \mu\text{in}$ $(13 + 0.9L) \mu\text{in}$	Comparison to P&W Labmaster® Universal, ASME Grade 00 Gage Blocks
Length Standards ²	Up to 2 in (2 to 4) in (4 to 6) in (6 to 12) in	$(4 + 1.5L) \mu\text{in}$ $(7 + 0.9L) \mu\text{in}$ $(11 + 0.6L) \mu\text{in}$ $(14 + 0.9L) \mu\text{in}$	Comparison to P&W Labmaster® Universal, ASME Grade 00 Gage Blocks
Cylindrical Pin/Plug Gages ²	Up to 1 in (1 to 2) in (2 to 4) in	$(4.2 + 0.7L) \mu\text{in}$ $(4.9 + 0.7L) \mu\text{in}$ $(6.4 + 0.5L) \mu\text{in}$	Comparison to P&W Labmaster® Universal, ASME Grade 00 Gage Blocks
Cylindrical Ring Gages (Plain)	Up to 0.5 in (0.5 to 1) in (1 to 2) in (2 to 4) in	$(17 + 0.15L) \mu\text{in}$ $(17 + 1.1L) \mu\text{in}$ $(17 + 1.2L) \mu\text{in}$ $(20 + 1.2L) \mu\text{in}$	Comparison to P&W Labmaster® Universal, ASME Grade 00 Gage Blocks, XX Ring Gages
Thread Wires (4 – 80) TPI	Up to 0.5 in	$(3.5 + 2.7L) \mu\text{in}$	Comparison to P&W Labmaster® Universal, ASME Grade 0 Gage Blocks
Thread Plug Gages, 60° Threads Major Diameter	Up to 0.5 in (0.5 to 1) in (1 to 2) in (2 to 4) in	$(20 + 0.3L) \mu\text{in}$ $(19 + 0.1L) \mu\text{in}$ $(19 + 0.21L) \mu\text{in}$ $(20 + 0.2L) \mu\text{in}$	Comparison to P&W Labmaster® Universal, ASME Grade 00 Gage Blocks, Thread Wires
Pitch Diameter	Up to 0.5 in (0.5 to 1) in (1 to 2) in (2 to 4) in	$(16 + 0.4L) \mu\text{in}$ $(16 + 0.12L) \mu\text{in}$ $(16 + 0.26L) \mu\text{in}$ $(17 + 0.23L) \mu\text{in}$	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Fixed Internal Thread Ring Gages Minor Diameter Pitch Diameter	Up to 0.5 in (0.5 to 1) in (1 to 2) in (2 to 4) in Up to 0.5 in (0.5 to 1) in (1 to 2) in (2 to 4) in	$(25 + 0.25L) \mu\text{in}$ $(25 + 0.08L) \mu\text{in}$ $(25 + 0.17L) \mu\text{in}$ $(25 + 0.16L) \mu\text{in}$ $(25 + 0.24L) \mu\text{in}$ $(25 + 0.08L) \mu\text{in}$ $(25 + 0.16L) \mu\text{in}$ $(25 + 0.15L) \mu\text{in}$	Comparison to P&W Labmaster® Universal, ASME Grade 00 Gage Blocks
Coordinate Measuring Machines (CMMs) ^{1,2} Linear Measurement (Axis X, Axis Y, Axis Z)	Up to 2 in (2 to 4) in (4 to 6) in (6 to 12) in (12 to 20) in	$(3.7 + 6.3L) \mu\text{in}$ $(4.1 + 5.8L) \mu\text{in}$ $(19 + 4.6L) \mu\text{in}$ $(13 + 5.4L) \mu\text{in}$ $(20 + 5.4L) \mu\text{in}$	Check Master per ISO 10360-2.
Vision Measuring System ^{1,2} Linear Measurement (Axis X, Axis Y, Axis Z)	Up to 2 in (2 to 4) in (4 to 6) in (6 to 12) in (12 to 20) in Up to 50 mm Up to 2 in Up to 200 mm	$(3.7 + 6.3L) \mu\text{in}$ $(4.1 + 5.8L) \mu\text{in}$ $(19.0 + 4.6L) \mu\text{in}$ $(13.0 + 5.4L) \mu\text{in}$ $(20 + 5.4L) \mu\text{in}$ $(0.4 + 0.26L) \mu\text{m}$ $(16 + 257L) \mu\text{in}$ $(0.3 + 0.26L) \mu\text{m}$	Comparison to ASME Grade 00 Gage Blocks, Grade 0 Long Gage Blocks, Glass Scale Up to 50 mm, Glass Scale Up to 2 in, Glass Scale Up to 200 mm
Stage Micrometer, Glass Scales ²	Up to 50 mm (50 to 200) mm Up to 2 in	$(1.1 \text{ to } 0.013L) \mu\text{m}$ $(1.2 + 0.016L) \mu\text{m}$ $(10.1 + 42L) \mu\text{in}$	Comparison to Mitutoyo QVT1-L404Z1L-D Quick Vision Active
Rulers, Tape Measures	Up to 12 in Up to 80 in	$(97 + 24L) \mu\text{in}$ $(9\,000 + 3.7L) \mu\text{in}$	Comparison to Mitutoyo QVT1-L404Z1L-D Quick Vision Active Gage Blocks

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Roughness Testers ¹	Ra 0.43 μm Rz 1.6 μm	0.065 μm 0.26 μm	Comparison to Roughness Specimens
	Ra 3 μm Rz 11.6 μm	0.065 μm 0.34 μm	
Granite Surface Plates Local Area Flatness	Up to 0.001 in	51 μin	Partial verification per using Repeat-o-Meter.

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Tools ¹	(5 to 50) ozf·in (5 to 1 000) lbf·in (25 to 1000) lbf·ft	0.13 % of reading 0.21% of reading 0.14 % of reading	Comparison to CDI Torque Transducers, Readout
Torque Calibration Systems	(5 to 50) ozf·in (5 to 1 000) lbf·in (25 to 1000) lbf·ft	0.13 % of reading 0.068 % of reading 0.039 % of reading	Comparison to CDI Torque Calibration Radius Arms, Hangers, Weights
Force Gauges, Load Cell Systems Tension	Up to 100 lbf (100 to 200) lbf (200 to 300) lbf (300 to 400) lbf (400 to 500) lbf	0.1 % of reading 0.067 % of reading 0.045 % of reading 0.068 % of reading 0.028 % of reading	Comparison to Force Transducers, Futek Indicator, 500 lbf Load Cell using a Universal Testing Machine
Compression	Up to 100 lbf (100 to 200) lbf (200 to 300) lbf (300 to 400) lbf (400 to 500) lbf	0.12 % of reading 0.068 % of reading 0.04 % of reading 0.038 % of reading 0.034 % of reading	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Gauges, Load Cell Systems Tension	Up to 200 lbf (200 to 400) lbf (400 to 600) lbf (600 to 800) lbf (800 to 1 000) lbf	0.32 % of reading 0.21 % of reading 0.21 % of reading 0.16 % of reading 0.09 % of reading	Comparison to Force Transducers, Futek Indicator, 1 000 lbf Load Cell using a Universal Testing Machine
Compression	Up to 200 lbf (200 to 400) lbf (400 to 600) lbf (600 to 800) lbf (800 to 1 000) lbf	0.41 % of reading 0.18 % of reading 0.13 % of reading 0.14 % of reading 0.12 % of reading	
Force Gauges, Load Cell Systems Tension	Up to 1 000 lbf (1 000 to 2 000) lbf (2 000 to 3 000) lbf (3 000 to 4 000) lbf (4 000 to 5 000) lbf	0.3 % of reading 0.25 % of reading 0.22 % of reading 0.17 % of reading 0.13 % of reading	Comparison to Force Transducers, Futek Indicator, 5 000 lbf Load Cell using a Universal Testing Machine
Compression	Up to 1 000 lbf (1 000 to 2 000) lbf (2 000 to 3 000) lbf (3 000 to 4 000) lbf (4 000 to 5 000) lbf	0.22 % of reading 0.16 % of reading 0.11 % of reading 0.11 % of reading 0.11 % of reading	
Force Gauges, Load Cell Systems Tension	Up to 2 000 lbf (2 000 to 4 000) lbf (4 000 to 6 000) lbf (6 000 to 8 000) lbf (8 000 to 10 000) lbf	0.2 % of reading 0.13 % of reading 0.17 % of reading 0.19 % of reading 0.14 % of reading	Comparison to Force Transducers, Futek Indicator, 10 000 lbf Load Cell using a Universal Testing Machine
Compression	Up to 2 000 lbf (2 000 to 4 000) lbf (4 000 to 6 000) lbf (6 000 to 8 000) lbf (8 000 to 10 000) lbf	0.16 % of reading 0.087 % of reading 0.084 % of reading 0.071 % of reading 0.099 % of reading	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Analytical Scales ^{1,3}	Up to 100 g (100 to 200) g (200 to 1 000) g	60 µg 0.3 mg 1.4 mg	ASTM E617 Class 1 weights and internal calibration procedure utilized in the calibration of the weighing system.
Scales / Balances ^{1,3}	Up to 50 g (50 to 200) g (200 to 500) g 500 g to 1 kg (1 to 5) kg (5 to 10) kg (10 to 25) kg (25 to 100) kg (100 to 300) kg (300 to 500) kg	1.3 mg 6.2 mg 7.1 mg 7.3 mg 1.5 g 3 g 10 g 35 g 150 g 270 g	NIST Class F weights and internal calibration procedure utilized in the calibration of the weighing system.
Mass Determination (SI Units)	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 25 kg	11 µg 11 µg 11 µg 12 µg 12 µg 13 µg 15 µg 18 µg 21 µg 24 µg 30 µg 36 µg 46 µg 62 µg 78 µg 0.14 mg 0.25 mg 1.1 mg 1.5 mg 11 mg 20 mg 0.11 g 0.13 g 0.14 g	Double Substitution per NISTIR 5672; Electronic Balances, OIML Class E2 weights, OIML Class F1 weights

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 1 lb 2 lb 5 lb 10 lb 20 lb	1 mg 1.3 mg 1.5 mg 2 mg 3.3 mg 6.3 mg 13 mg 27 mg 52 mg 81 mg 0.11 g 0.27 g 0.52 g 0.6 g	Comparison to Electronic Balances, NIST Class F Weights
Pneumatic Gage Pressure Measuring Devices	(-2.2 to 2.2) psi (0 to 30) psi (-13.5 to 0) psi (> 30 to 300) psi (0 to 3 000) psi	0.000 12 psi 0.001 2 psi 0.001 9 psi 0.013 psi 0.14 psi	Comparison to Fluke Pressure Module PM600-BG15K PM600-G200K PM500-BG2M PM500-BG20M
Pneumatic Pressure Gauges ¹ (Gauge Pressure)	(-12 to 0) psi (0 to 300) psi	0.018 psi 0.025 psi	Comparison to Fluke 2700G-BG2M Pressure Calibrator
Pneumatic Pressure Gauges ¹ (Gauge Pressure)	(-1 to 1) psi	0.000 5 psi	Comparison to Meriam Instruments ZM1004-DN0001 Digital Manometer
Pneumatic Low-Pressure Gauges and Measure (Gauge Pressure)	(-13.75 to 0) psi Up to 36 psi	0.007 5 psi 0.041 % of reading + 0.001 8 psi	Comparison to Fluke 721-3603 (PORT 1) Pressure Calibrator
Pneumatic/Hydraulic High Pressure Gauges (Gauge Pressure)	Up to 3 000 psi	0.42 psi	Comparison to Fluke 2700G-G20M Pressure Gauge

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pneumatic/Hydraulic High Pressure Gauges (Gauge Pressure)	Up to 10 000 psi	1.2 psi	Comparison to Dead Weight Pressure Generation (Piston Cylinder and Masses), Fluke 2700G-G70M Pressure Gauge
Volumetric Flow Meters ²	(3 to 30) sccm (30 to 300) sccm (0.1 to 1) slpm (1 to 10) slpm (10 to 100) slpm	(0.058 + 0.001 8X) sccm (0.18 + 0.002 7X) sccm (0.001 2 + 0.002 5X) slpm (0.007 + 0.002 6X) slpm (0.022 + 0.003 7X) slpm	Comparison to CME DIVISION 60B-75-.03-1000(SP) Flowmeter
Flow/Leak Masters ²	(3 to 30) sccm (30 to 300) sccm (0.1 to 1) slpm (1 to 10) slpm	(0.029 + 0.008 5X) sccm (0.3 + 0.008 4X) sccm (0.001 1 + 0.008 1X) slpm (0.011 + 0.008 6X) slpm	Comparison to CME DIVISION 60B-75-.03-1000(SP) Flowmeter
Rockwell Hardness Testing Machines ¹	HRC Low Medium High	0.42 HRC 0.42 HRC 0.36 HRC	Indirect Verification per ASTM E18 using Rockwell Hardness Test Blocks.

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Measuring Devices	(11 to 91) %RH	1.5 % RH	Comparison to Vaisala HMP77B Thermo-hygrometer
Dewpoint – Measure ¹	(-40 to -10.4) °C	2.5 °C	Comparison to Vaisala DMP74A Dewpoint/Temperature Probe
Temperature – Measure ¹	(-40 to 40) °C	0.26 °C	Direct measure using Vaisala HMP77B Thermo-hygrometer
Temperature – Radiation Thermometers	(35 to 100) °C (100 to 200) °C (200 to 350) °C (350 to 500) °C	1.1 °C 1.9 °C 3.1 °C 4.5 °C	Comparison to Fluke 4181 IR Calibrator (Flat Plate) $\lambda = (8 \text{ to } 14) \mu\text{m}$, $\epsilon \sim 0.95$

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Digital Thermometers, Bimetallic Thermometers, Temperature Probes	(-45 to 100) °C (100 to 300) °C (300 to 420) °C (429 to 650) °C	0.05 °C 0.095 °C 0.15 °C 0.19 °C	Comparison to Fluke 5628 PRT, Fluke 1523 Readout using Fluke 9144 Dry Well, Fluke 9170 Dry Well
Temperature – Measure	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 420) °C (429 to 650) °C	0.054 °C 0.055 °C 0.065 °C 0.12 °C 0.13 °C	Comparison to Fluke 5628 PRT, Fluke 1523 Readout
Thermocouple Calibration	(-45 to 100) °C (100 to 300) °C (300 to 420) °C (429 to 650) °C	0.11 °C 0.14 °C 0.18 °C 0.22 °C	Comparison to Fluke 5628 PRT, Fluke 1523 Readout; Fluke 9144 Dry Well, Fluke 9170 Dry Well; Fluke 5522A as Thermocouple Readout

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Stopwatch	(1 to 86 400) s	73 ms	Comparison to Agilent 53132A Frequency Counter
Linear Velocity Measure ¹	Up to 4 in/min Up to 40 in/min	0.01 in/min 0.14 in/min	Comparison to Digital Stopwatch, Caliper
Frequency – Measure ^{2,4}	1 Hz to 1 MHz	5.8 µHz/Hz + 31 µHz	Comparison to Agilent 3458A 8.5 Digit Multimeter
Frequency – Measure ^{2,4}	(1 to 225) MHz 225 MHz to 3 GHz	2.6 mHz 61 mHz	Comparison to Agilent 53132A Frequency Counter
Frequency – Measure ^{2,4}	(3 to 26.5) GHz	0.37 nHz/Hz + 8.5 Hz	Comparison to HP 53151A Microwave Frequency Counter

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source ¹	10 mHz to 2 MHz	2 μ Hz/Hz	Comparison to Fluke 55xxA Multi-Product Calibrator
Frequency – Source ¹	50 kHz 500 kHz 5 MHz 50 MHz 300 MHz	1.3 Hz 13 Hz 0.13 kHz 1.3 kHz 7.5 kHz	Comparison to Fluke 5502A/3 Multi-Product Calibrator with 300 MHz Scope Option

DIMENSIONAL MEASUREMENT

3 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
3D Dimensional – Measurement	X = Up to 320 mm Y = Up to 320 mm Z = Up to 150 mm	5.3 μ m	Mitutoyo QVT1-L404Z1L-D Quick Vision Active, CNC Vision Measuring System, Customer Drawings

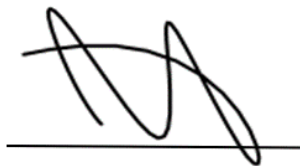
3 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
3D Dimensional – Measurement ¹	Up to 1.8 m	52 μ m	Faro Articulated Arm Coordinate Measuring Machines (AACMM), Customer Drawings

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 millimeters, L = length in inches or millimeters, R = resolution of unit under test, X = indicated value, ' = arc-minute.
3. The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
4. The Best Measurement Capability presented here does not include Resolution of the Measurand. $0.6R$ will be added at the time of calibration, where R = resolution.
5. The value shown in the Range column is a nominal value. The actual certified value will be utilized during the calibration with the associated measurement uncertainty.
6. Unless otherwise specified in the far-right column, the calibration method/procedure utilized by the laboratory was developed and validated internally.



Jason Stine, Vice President