



# CERTIFICATE OF ACCREDITATION

## The ANSI National Accreditation Board

Hereby attests that

**Metrology Lab Co., Ltd.**  
**3/2 Soi Ramkhamhaeng164 Yak 16**  
**Sub district: Minburi, District: Minburi**  
**Bangkok 10510, Thailand**

Fulfills the requirements of

**ISO/IEC 17025:2017**

In the field of

**CALIBRATION**

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](http://www.anab.org).

A handwritten signature in black ink, appearing to be 'J. Stine', is positioned above a horizontal line.

Jason Stine, Vice President

Expiry Date: 03 November 2024

Certificate Number: AC-3255



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

**Metrology Lab Co., Ltd.**  
3/2 Soi Ramkhamhaeng164 Yak16  
Sub district: Minburi, District: Minburi,  
Bangkok 10510, Thailand  
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### CALIBRATION

Valid to: **November 3, 2024**

Certificate Number: **AC-3255**

#### Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sound Level Meters	1 kHz		Sound Level Calibrator; WI-18-L07
	94 dB 114 dB	0.11 dB 0.11 dB	
Vibration Meters			Vibration Calibrator; WI-18-L05
Acceleration (Peak)	79.58 Hz, 160 Hz (0 to 10) m/s <sup>2</sup> (> 10 to 20) m/s <sup>2</sup>	0.14 m/s <sup>2</sup> 0.75 m/s <sup>2</sup>	
Velocity (RMS)	79.58 Hz, 160 Hz (0 to 10) mm/s (> 10 to 30) mm/s (> 30 to 50) mm/s	0.13 mm/s 0.69 mm/s 1.1 mm/s	
Displacement (Peak-Peak)	79.58 Hz, 160 Hz (0 to 0.05) mm (> 0.05 to 0.1) mm	1.5 μm 4.4 μm	

#### Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters	4.01 pH	0.018 pH	Accredited pH Buffer Solutions; WI-18-C01
	7 pH	0.018 pH	
	9.21 pH	0.018 pH	
	10.01 pH	0.018 pH	

**Chemical Quantities**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>2</sup> Conductivity Meters	5 $\mu$ S/cm 84 $\mu$ S/cm 1413 $\mu$ S/cm 12.88 mS/cm	0.16 $\mu$ S/cm 1.3 $\mu$ S/cm 22 $\mu$ S/cm 197 $\mu$ S/cm	Accredited Conductivity Solutions; WI-18-C02
<sup>2</sup> ORP Meters	220 mV 468 mV	1.1 mV 1.7 mV	Accredited ORP Solutions; WI-18-C03
<sup>2</sup> TDS Meters	0.15 % TDS	0.002 %TDS	Accredited TDS Solutions; WI-18-C04
<sup>2</sup> Salinity Meters	4.5 % Salinity	0.07 %Salinity	Accredited Salinity Solution; WI-18-C05
<sup>2</sup> Dissolved Oxygen Meters	(0 to 21) % O <sub>2</sub>	0.058 %O <sub>2</sub>	Accredited Gas Mixtures; WI-18-C06

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Generate	(0 to 20) mV (> 20 to 200) mV (> 0.2 to 2) V (> 2 to 20) V (> 20 to 200) V (> 200 to 1 000) V	0.35 mV/V + 12 $\mu$ V 0.12 mV/V + 18 $\mu$ V 44 $\mu$ V/V + 11 $\mu$ V 41 $\mu$ V/V + 0.9 $\mu$ V 41 $\mu$ V/V + 0.7 mV 0.12 mV/V + 7.1 mV	Metrix CX 1651 Multifunction Calibrator; WI-18-E18
DC Current – Generate	(0 to 200) $\mu$ A (> 0.2 to 2) mA (> 2 to 20) mA (> 20 to 200) mA (> 0.2 to 2) A (> 2 to 20) A	0.58 mA/A + 24 nA 0.29 mA/A + 8.6 nA 0.16 mA/A + 86 nA 0.16 mA/A + 0.9 $\mu$ A 0.24 mA/A + 8.6 $\mu$ A 0.35 mA/A + 0.12 mA	Metrix CX 1651 Multifunction Calibrator; WI-18-E20
DC Current Clamp Meters (Generate)	(0 to 20) A (> 20 to 100) A (> 100 to 1 000) A	0.35 mA/A + 36 mA 2.4 mA/A + 59 mA 2.4 mA/A + 0.14 A	Metrix CX 1651 Multifunction Calibrator, 50-turn Current Coil; WI-18-E10
AC Voltage – Generate	(1 to 20) mV 20 Hz to 10 kHz (> 10 to 50) kHz (> 50 to 100) kHz	2.9 mV/V + 24 $\mu$ V 3.5 mV/V + 24 $\mu$ V 13 mV/V + 24 $\mu$ V	Metrix CX 1651 Multifunction Calibrator; WI-18-E19



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Generate	(> 20 to 200) mV		Metrix CX 1651 Multifunction Calibrator; WI-18-E19
	20 Hz to 10 kHz	1.6 mV/V + 24 $\mu$ V	
	(> 10 to 50) kHz	2.4 mV/V + 24 $\mu$ V	
	(> 50 to 100) kHz	4.1 mV/V + 24 $\mu$ V	
	(> 0.2 to 2) V		
	20 Hz to 10 kHz	0.35 mV/V + 17 $\mu$ V	
	(> 10 to 50) kHz	0.7 mV/V + 17 $\mu$ V	
	(> 50 to 100) kHz	2.9 mV/V + 13 $\mu$ V	
	(> 2 to 20) V		
	20 Hz to 10 kHz	0.35 mV/V + 0.14 mV	
	(> 10 to 50) kHz	0.93 mV/V + 95 $\mu$ V	
	(> 50 to 100) kHz	2.9 mV/V + 0.41 mV	
AC Current – Generate	(1 to 200) $\mu$ A		Metrix CX 1651 Multifunction Calibrator; WI-18-E21
	20 Hz to 1 kHz	1.7 mA/A + 24 nA	
	(> 1 to 5) kHz	4.7 mA/A + 24 nA	
	(> 0.2 to 2) mA		
	20 Hz to 1 kHz	0.93 mA/A + 59 nA	
	(> 1 to 5) kHz	2.9 mA/A + 59 nA	
	(> 5 to 10) kHz	6.6 mA/A + 59 nA	
	(> 2 to 20) mA		
	20 Hz to 1 kHz	0.64 mA/A + 80 nA	
	(> 1 to 5) kHz	2.9 mA/A + 70 nA	
	(> 5 to 10) kHz	6.6 mA/A + 90 nA	
	(> 20 to 200) mA		
20 Hz to 1 kHz	0.64 mA/A + 1.3 $\mu$ A		
(> 1 to 5) kHz	2.9 mA/A + 1.6 $\mu$ A		
(> 5 to 10) kHz	6.6 mA/A + 0.7 $\mu$ A		
AC Current Clamp Meters (Generate)	(> 0.2 to 2) A		Metrix CX 1651 Multifunction Calibrator, 50-turn Current Coil; WI-18-E11
	20 Hz to 1 kHz	0.64 mA/A + 14 $\mu$ A	
	(> 2 to 20) A		
	20 Hz to 1 kHz	1.6 mA/A + 0.2 mA	
AC Current Clamp Meters (Generate)	(45 to 65) Hz		Metrix CX 1651 Multifunction Calibrator, 50-turn Current Coil; WI-18-E11
	(> 0.1 to 20) A	1.6 mA/A + 36 mA	
	(> 20 to 100) A	2.4 mA/A + 59 mA	
	(> 100 to 1 000) A	2.8 mA/A + 0.14 A	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Generate (Simulation)	(0 to 200) $\Omega$ ( $> 0.2$ to 2) k $\Omega$ ( $> 2$ to 20) k $\Omega$ ( $> 20$ to 200) k $\Omega$ ( $> 0.2$ to 1) M $\Omega$ ( $> 1$ to 10) M $\Omega$ ( $> 10$ to 50) M $\Omega$	0.35 m $\Omega/\Omega$ + 12 m $\Omega$ 0.18 m $\Omega/\Omega$ + 1 m $\Omega$ 0.18 m $\Omega/\Omega$ + 19 m $\Omega$ 0.18 m $\Omega/\Omega$ + 0.87 $\Omega$ 0.58 m $\Omega/\Omega$ + 0.38 k $\Omega$ 2.4 m $\Omega/\Omega$ + 0.28 k $\Omega$ 5.8 m $\Omega/\Omega$ + 19 k $\Omega$	Metrix CX 1651 Multifunction Calibrator; WI-18-E22
2-wire Resistance – Generate (Simulation)	(0 to 120) $\Omega$ (0.12 to 1.2) k $\Omega$ (1.2 to 12) k $\Omega$ (12 to 120) k $\Omega$ (0.12 to 1.2) M $\Omega$ (1.2 to 12) M $\Omega$ (12 to 120) M $\Omega$	45 $\mu\Omega/\Omega$ + 13 m $\Omega$ 45 $\mu\Omega/\Omega$ + 0.11 $\Omega$ 45 $\mu\Omega/\Omega$ + 0.88 $\Omega$ 45 $\mu\Omega/\Omega$ + 11 $\Omega$ 53 $\mu\Omega/\Omega$ + 62 $\Omega$ 67 $\mu\Omega/\Omega$ + 0.11 $\Omega$ 0.11 m $\Omega/\Omega$ + 2.6 $\Omega$	Valhalla Scientific 2724A Programmable Resistance Standard; WI-18-E05
4-wire Resistance – Generate (Simulation)	(0 to 120) $\Omega$ (0.12 to 1.2) k $\Omega$ (1.2 to 12) k $\Omega$ (12 to 120) k $\Omega$ (0.12 to 1.2) M $\Omega$ (1.2 to 12) M $\Omega$ (12 to 120) M $\Omega$	37 $\mu\Omega/\Omega$ + 13 m $\Omega$ 37 $\mu\Omega/\Omega$ + 0.11 $\Omega$ 37 $\mu\Omega/\Omega$ + 0.88 $\Omega$ 46 $\mu\Omega/\Omega$ + 11 $\Omega$ 46 $\mu\Omega/\Omega$ + 63 $\Omega$ 59 $\mu\Omega/\Omega$ + 0.11 $\Omega$ 94 $\mu\Omega/\Omega$ + 2.6 $\Omega$	Valhalla Scientific 2724A Programmable Resistance Standard; WI-18-E05
Resistance – Generate (Fixed Artifacts)	1 m $\Omega$ 10 m $\Omega$ 100 m $\Omega$ 1 $\Omega$	5.8 $\mu\Omega$ 58 $\mu\Omega$ 0.58 m $\Omega$ 5.8 m $\Omega$	Fixed Resistors P310, P321; WI-18-E39
Capacitance – Source (Simulation)	(0.9 to 2.5) nF ( $> 2.5$ to 10) nF ( $> 10$ to 50) nF ( $> 50$ to 250) nF ( $> 0.25$ to 1) $\mu\text{F}$ ( $> 1$ to 2.5) $\mu\text{F}$ ( $> 2.5$ to 5) $\mu\text{F}$ ( $> 5$ to 10) $\mu\text{F}$ ( $> 10$ to 50) $\mu\text{F}$	5.8 mF/F + 18 pF 5.8 mF/F + 9.1 pF 5.8 mF/F + 5.8 pF 5.8 mF/F + 58 pF 5.8 mF/F + 0.58 nF 12 mF/F + 0.58 nF 12 mF/F + 5.8 nF 18 mF/F + 5.8 nF 24 mF/F + 58 nF	Metrix CX 1651 Multifunction Calibrator, WI-18-E23
Inductance – Generate (Variable Artifact)	(1 to 9) mH ( $> 10$ to 99) mH ( $> 100$ to 999) mH ( $> 1$ to 9.999) H	24 mH/H + 0.58 $\mu\text{H}$ 24 mH/H + 5.8 $\mu\text{H}$ 24 mH/H + 58 $\mu\text{H}$ 24 mH/H = 0.58 mH	Decade Inductance Box; WI-18-E06



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source	(0 to 200) mV (> 0.2 to 2) V (> 2 to 20) V (> 20 to 200) V (> 200 to 1 000) V	76 $\mu$ V/V + 0.6 $\mu$ V 48 $\mu$ V/V + 11 $\mu$ V 53 $\mu$ V/V + 62 $\mu$ V 66 $\mu$ V/V + 0.6 mV 76 $\mu$ V/V + 5.9 mV	Rigol DM3068 6.5 Digit Multimeter; WI-18-E32
DC High Voltage – Measure	(0.5 to 10) kV	12 mV/V + 3.6 V	Hange HM3676A High Voltage Meter; WI-18-E13
DC Current – Measure	(1 to 200) $\mu$ A (> 0.2 to 2) mA (> 2 to 20) mA (> 20 to 200) mA (> 0.2 to 2) A (> 2 to 10) A	0.76 mA/A + 0.6 nA 0.62 mA/A + 5.8 nA 0.76 mA/A + 59 nA 0.62 mA/A + 0.6 $\mu$ A 1.4 mA/A + 5.8 $\mu$ A 1.9 mA/A + 58 $\mu$ A	Rigol DM3068 6.5 Digit Multimeter; WI-18-E34
DC Current – Measure	Up to 32 A	1.5 mA/A + 0.6 mA	Rigol DM3068 6.5 Digit Multimeter, Current Shunt; WI-18-E40 using Ohm’s Law
AC Voltage – Measure	Up to 200 mV 20 Hz to 20 kHz (> 20 to 50) kHz (> 50 to 100) kHz (> 0.2 to 2) V 20 Hz to 20 kHz (> 20 to 50) kHz (> 50 to 100) kHz (> 2 to 20) V 20 Hz to 20 kHz (> 20 to 50) kHz (> 50 to 100) kHz (> 20 to 200) V 20 Hz to 20 kHz (> 20 to 50) kHz (> 50 to 100) kHz (> 200 to 750) V 20 Hz to 20 kHz (> 20 to 50) kHz (> 50 to 100) kHz	1.2 mV/V + 0.61 $\mu$ V 2 mV/V + 0.62 $\mu$ V 7.9 mV/V + 0.63 $\mu$ V 1.1 mV/V + 8.5 $\mu$ V 2 mV/V + 8.4 $\mu$ V 7.9 mV/V + 8.3 $\mu$ V 1.4 mV/V + 60 $\mu$ V 2.4 mV/V + 62 $\mu$ V 7.9 mV/V + 63 $\mu$ V 1.3 mV/V + 0.61 $\mu$ V 2.4 mV/V + 0.61 $\mu$ V 7.9 mV/V + 0.61 $\mu$ V 1.3 mV/V + 0.62 mV 2.4 mV/V + 0.62 mV 7.9 mV/V + 0.62 mV	Rigol DM3068 6.5 Digit Multimeter; WI-18-E33
AC High Voltage – Measure	(50 to 60) Hz (0.5 to 10) kV	12 mV/V + 3.6 V	Hange HM3676A High Voltage Meter; WI-18-E13



**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
AC Current – Measure	(1 to 200) $\mu$ A 20 Hz to 5 kHz	2.5 mA/A + 0.6 nA	Rigol DM3068 6.5 Digit Multimeter; WI-18-E35	
	(> 0.2 to 2) mA 20 Hz to 5 kHz	1.9 mA/A + 5.9 nA		
	(> 2 to 20) mA 20 Hz to 5 kHz	2.5 mA/A + 59 nA		
	(> 20 to 200) mA 20 Hz to 5 kHz	1.7 mA/A + 0.62 $\mu$ A		
	(> 0.2 to 2) A 20 Hz to 5 kHz	2.5 mA/A + 6.7 $\mu$ A		
	(> 2 to 10) A 20 Hz to 5 kHz	2.9 mA/A + 63 $\mu$ A		
AC Current – Measure	(50 to 60) Hz Up to 32 A	24 mA/A + 0.6 mA	Rigol DM3068 6.5 Digit Multimeter, Current Shunt; WI-18-E40 using Ohm's Law	
2-wire Resistance – Measure	(0 to 200) $\Omega$	0.17 m $\Omega$ / $\Omega$ + 0.6 m $\Omega$	Rigol DM3068 6.5 Digit Multimeter; WI-18-E36	
	(> 0.2 to 2) k $\Omega$	0.13 m $\Omega$ / $\Omega$ + 6.3 m $\Omega$		
	(> 2 to 20) k $\Omega$	0.13 m $\Omega$ / $\Omega$ + 63 $\Omega$		
	(> 20 to 200) k $\Omega$	0.13 m $\Omega$ / $\Omega$ + 0.6 $\Omega$		
	(> 0.2 to 1) M $\Omega$	0.16 m $\Omega$ / $\Omega$ + 6.3 $\Omega$		
	(> 1 to 10) M $\Omega$	0.48 m $\Omega$ / $\Omega$ + 0.6 $\Omega$		
	(> 10 to 100) M $\Omega$	9.4 m $\Omega$ / $\Omega$ + 0.6 k $\Omega$		
4-wire Resistance – Measure	(0 to 200) $\Omega$	0.17 m $\Omega$ / $\Omega$ + 0.6 m $\Omega$	Rigol DM3068 6.5 Digit Multimeter, WI-18-E36	
	(> 0.2 to 2) k $\Omega$	0.13 m $\Omega$ / $\Omega$ + 6.3 m $\Omega$		
	(> 2 to 20) k $\Omega$	0.13 m $\Omega$ / $\Omega$ + 63 $\Omega$		
	(> 20 to 200) k $\Omega$	0.13 m $\Omega$ / $\Omega$ + 0.6 $\Omega$		
	(> 0.2 to 1) M $\Omega$	0.16 m $\Omega$ / $\Omega$ + 6.3 $\Omega$		
	(> 1 to 10) M $\Omega$	0.48 m $\Omega$ / $\Omega$ + 0.6 $\Omega$		
	(> 10 to 100) M $\Omega$	9.4 m $\Omega$ / $\Omega$ + 0.6 k $\Omega$		
Capacitance – Measure	Up to 2 nF	52 mF/F + 5.8 pF	Rigol DM3068 6.5 Digit Multimeter; WI-18-E38	
	(> 2 to 20) nF	16 mF/F + 58 pF		
	(> 20 to 200) nF	16 mF/F + 0.58 nF		
	(> 0.2 to 2) $\mu$ F	16 mF/F + 5.8 nF		
	(> 2 to 20) $\mu$ F	16 mF/F + 58 nF		
	(> 20 to 200) $\mu$ F	16 mF/F + 0.58 $\mu$ F		
Capacitance – Measure	(> 0.2 to 2) mF	16 mF/F + 5.8 $\mu$ F	Rigol DM3068 6.5 Digit Multimeter; WI-18-E38	
	(> 2 to 20) mF	15 mF/F + 58 $\mu$ F		
	(> 20 to 100) mF	37 mF/F + 0.58 mF		



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Cutoff Current	(0.5 to 10) A	0.76 mA/A + 24 nA	Rigol DM3068 6.5 Digit Multimeter; WI-18-E08 using Apply Voltage and Measure Resistance Method.
AC Cutoff Current	(50 to 60) Hz (0.5 to 10) mA	2.5 mA/A + 24 nA	Rigol DM3068 6.5 Digit Multimeter; WI-18-E08 using Apply Voltage and Measure Resistance Method.
DC Power – Generate	(0.2 to 2) V (2 to 20) mA 400 $\mu$ W to 40 mW (20 to 200) mA (4 to 400) mW (0.2 to 2) A 40 mW to 4 W (2 to 10) A 400 mW to 20 W (2 to 20) V (2 to 20) mA (4 to 400) mW (20 to 200) mA 40 mW to 4 W (0.2 to 2) A (0.4 to 40) W (2 to 10) A (4 to 200) W (20 to 240) V (2 to 20) mA 40 mW to 4.8 W (20 to 200) mA 400 mW to 48 W (0.2 to 2) A (4 to 480) W (2 to 10) A 40 W to 2.4 kW	0.71 mW/W + 10 $\mu$ W 0.65 mW/W + 0.1 mW 0.65 mW/W + 1 mW 0.71 mW/W + 10 mW 0.71 mW/W + 0.1 mW 0.65 mW/W + 1 mW 0.65 mW/W + 10 mW 0.71 mW/W + 0.1 W 0.71 mW/W + 1 mW 0.65 mW/W + 10 mW 0.65 mW/W + 0.1 W 0.71 mW/W + 1 W	Metrix CX 1651 Multifunction Calibrator; WI-18-E15



**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
AC Power – Generate (45 to 65) Hz (0.5 to 0.999) PF	(0.2 to 2) V (2 to 20) mA 400 $\mu$ W to 40 mW	5.4 mW/W + 10 $\mu$ W	Metrix CX 1651 Multifunction Calibrator; WI-18-E16	
	(20 to 200) mA (4 to 400) mW	5.4 mW/W + 0.1 mW		
	(0.2 to 2) A 40 mW to 4 W	5.4 mW/W + 1 mW		
	(2 to 10) A 400 mW to 20 W	5.4 mW/W + 10 mW		
	(2 to 20) V (2 to 20) mA (4 to 400) mW	5.4 mW/W + 10 $\mu$ W		
	(20 to 200) mA 40 mW to 4 W	5.4 mW/W + 0.1 mW		
	(0.2 to 2) A (0.4 to 40) W	5.4 mW/W + 1 mW		
	(2 to 10) A (4 to 200) W	5.4 mW/W + 10 mW		
	(20 to 240) V (2 to 20) mA 40 mW to 4.8 W	5.4 mW/W + 0.1 mW		
	(20 to 200) mA 400 mW to 48 W	5.4 mW/W + 1 mW		
	(0.2 to 2) A (4 to 480) W	5.4 mW/W + 10 mW		
	(2 to 10) A 40 W to 2.4 kW	5.4 mW/W + 0.1 W		
	(45 to 65) Hz 1 PF	(0.2 to 2) V (2 to 20) mA 400 $\mu$ W to 40 mW		0.85 mW/W + 10 $\mu$ W
		(20 to 200) mA (4 to 400) mW		0.81 mW/W + 0.1 mW
		(0.2 to 2) A 40 mW to 4 W		0.81 mW/W + 1 mW
		(2 to 10) A 400 mW to 20 W		0.85 mW/W + 10 mW

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Generate (45 to 65) Hz 1 PF	(2 to 20) V (2 to 20) mA (4 to 400) mW (20 to 200) mA 40 mW to 4 W (0.2 to 2) A (0.4 to 40) W (2 to 10) A (4 to 200) W	0.85 mW/W + 10 μW 0.81 mW/W + 0.1 mW 0.81 mW/W + 1 mW 0.85 mW/W + 10 mW	Metrix CX 1651 Multifunction Calibrator; WI-18-E16
(20 to 240) V (2 to 20) mA 40 mW to 4.8 W (20 to 200) mA 400 mW to 48 W (0.2 to 2) A (4 to 480) W (2 to 10) A 40 W to 2.4 kW	0.85 mW/W + 0.1 mW 0.81 mW/W + 1 mW 0.81 mW/W + 10 mW		
Insulation Resistance Testers	(10 to 125) V 100 Ω to 1 kΩ (100 to 1 000) V (1 to 10) MΩ (> 10 to 100) MΩ > 100 MΩ to 1 GΩ	3.5 mΩ/Ω + 0.71 kΩ 3.5 mΩ/Ω + 7.1 kΩ 3.5 mΩ/Ω + 71 kΩ 3.5 mΩ/Ω + 0.71 MΩ	Decade Resistance Box; WI-18-E12
Resistors, Standard Resistors, Decade Resistors	(10 to 20) V (1 to 10) kΩ (> 10 to 100) kΩ (> 0.1 to 1) MΩ (> 1 to 10) MΩ (> 20 to 200) V (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	0.77 mΩ/Ω 0.8 mΩ/Ω 0.63 mΩ/Ω 0.63 mΩ/Ω 0.63 mΩ/Ω 0.77 mΩ/Ω 0.63 mΩ/Ω 0.63 mΩ/Ω 0.63 mΩ/Ω 0.63 mΩ/Ω	Metrix CX 1651 Multifunction Calibrator, Rigol DM3068 6.5 Digit Multimeter; WI-18-43 using Ohm’s Law, applying the Voltage and measuring the Current to calculate Resistance.

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistors, Standard Resistors, Decade Resistors	(> 200 to 1 000) V (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	2.2 mΩ/Ω 1.8 mΩ/Ω 2.2 mΩ/Ω 1.8 mΩ/Ω 1.8 mΩ/Ω 1.8 mΩ/Ω	Metrix CX 1651 Multifunction Calibrator, Rigol DM3068 6.5 Digit Multimeter; WI-18-43 using Ohm's Law, applying the Voltage and measuring the Current to calculate Resistance.
Resistors, Shunts	(0.1 to 20) A 1 mΩ 10 mΩ 100 mΩ 1 Ω	2.6 mΩ/Ω + 58 nΩ 2.6 mΩ/Ω + 0.58 μΩ 3.1 mΩ/Ω + 5.8 μΩ 3.1 mΩ/Ω + 58 μΩ	Metrix CX 1651 Multifunction Calibrator, Rigol DM3068 6.5 Digit Multimeter; WI-18-43 using Ohm's Law, applying the Current and measuring the Voltage drop to calculate Resistance.
pH Meter mV Simulation	(0 to 450) mV	78 μV	Portable Calibrator; WI-18-E42
DC Voltage – Generate	(0 to 100) mV (0 to 12) V	81 μV/V + 77 μV 70 μV/V + 5.8 mV	Portable Calibrator; WI-18-E44
DC Current – Generate	(0 to 24) mA	0.14 mA/A + 6 μA	Portable Calibrator; WI-18-E44
Resistance – Generate	(0 to 400) Ω (> 400 to 2 000) Ω	0.16 mΩ/Ω + 59 mΩ 0.12 mΩ/Ω + 0.6 Ω	Portable Calibrator; WI-18-E44
DC Voltage – Measure	(0 to 100) mV (> 100 to 600) mV (> 0.6 to 6) V (> 6 to 60) V	93 μV/V + 8.3 μV 0.12 mV/V + 16 μV 0.14 mV/V + 0.14 mV 0.14 mV/V + 1.4 mV	Portable Calibrator; WI-18-E45
DC Current – Measure	(0 to 52) mA	0.16 mA/A + 1.3 μA	Portable Calibrator; WI-18-E45
Resistance – Measure	(0 to 400) Ω (> 400 to 2 000) Ω	0.18 mΩ/Ω + 5.8 mΩ 0.18 mΩ/Ω + 0.13 Ω	Portable Calibrator; WI-18-E45
Oscilloscopes AC Square-wave 50 Ω load	1 Hz to 10 kHz (1 to 20) mVp-p (20 to 200) mVp-p (> 0.2 to 2) Vp-p (> 2 to 10) Vp-p	2.4 mV/V + 59 μV 1.2 mV/V + 92 μV 1.2 mV/V + 0.71 mV 1.2 mV/V + 7.1 mV	Metrix CX 1651 Multifunction Calibrator; WI-18-E49



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes AC Square-wave 50 Ω load	1 Hz to 10 kHz (1 to 20) mVp-p (20 to 200) mVp-p (> 0.2 to 2) Vp-p (> 2 to 10) Vp-p	5.8 mV/V + 9.1 μV 5.8 μV/V + 59 μV 5.8 mV/V + 0.71 mV 5.8 mV/V + 7.1 mV	Junce JDS6600 Function Generator; WI-18-E50
Electrical Simulation of Thermocouple Indicating Devices – Generate	Type E (-200 to 0) °C (> 0 to 500) °C (> 500 to 1 000) °C Type J (-210 to 0) °C (> 0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 200) °C Type K (-200 to 0) °C (> 0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 372) °C Type N (-200 to 0) °C (> 0 to 400) °C (> 400 to 1 300) °C Type R (0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 767) °C Type S (0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 767) °C Type T (-200 to 0) °C (> 0 to 100) °C (> 100 to 400) °C	0.5 °C 0.31 °C 0.34 °C 0.36 °C 0.31 °C 0.32 °C 0.34 °C 0.39 °C 0.32 °C 0.36 °C 0.43 °C 0.43 °C 0.33 °C 0.36 °C 0.54 °C 0.38 °C 0.43 °C 0.47 °C 0.4 °C 0.46 °C 0.57 °C 0.35 °C 0.32 °C	Multifunction Calibrator; WI-18-T19



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Measure	Type E		Digital Multimeter; WI-18-T21
	(-200 to 0) °C	0.49 °C	
	(> 0 to 400) °C	0.3 °C	
	(>400 to 1 300) °C	0.33 °C	
	Type J		
	(-210 to 0) °C	0.36 °C	
	(> 0 to 500) °C	0.3 °C	
	(> 500 to 1 000) °C	0.31 °C	
	(> 1 000 to 1 200) °C	0.33 °C	
	Type K		
	(-200 to 0) °C	0.38 °C	
	(> 0 to 500) °C	0.31 °C	
	(> 500 to 1 000) °C	0.36 °C	
	(> 1 000 to 1 372) °C	0.43 °C	
	Type N		
	(-200 to 0) °C	0.43 °C	
	(> 0 to 400) °C	0.32 °C	
	(> 400 to 1 300) °C	0.36 °C	
Type R			
(0 to 500) °C	0.54 °C		
(> 500 to 1 000) °C	0.38 °C		
(> 1 000 to 1 767) °C	0.42 °C		
Type S			
(0 to 500) °C	0.47 °C		
(> 500 to 1 000) °C	0.39 °C		
(> 1 000 to 1 767) °C	0.45 °C		
Type T			
(-200 to 0) °C	0.57 °C		
(> 0 to 100) °C	0.34 °C		
(> 100 to 400) °C	0.31 °C		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Generate	Type E (-200 to 0) °C (> 0 to 400) °C (>400 to 1 300) °C Type J (-210 to 0) °C (> 0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 200) °C Type K (-200 to 0) °C (> 0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 372) °C Type N (-200 to 0) °C (> 0 to 400) °C (> 400 to 1 300) °C Type R (0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 767) °C Type S (0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 767) °C Type T (-200 to 0) °C (> 0 to 100) °C (> 100 to 400) °C	0.57 °C 0.42 °C 0.44 °C 0.46 °C 0.42 °C 0.42 °C 0.44 °C 0.48 °C 0.42 °C 0.46 °C 0.52 °C 0.52 °C 0.43 °C 0.46 °C 0.61 °C 0.47 °C 0.51 °C 0.55 °C 0.56 °C 0.53 °C 0.64 °C 0.45 °C 0.42 °C	Portable Calibrator; WI-18-T01
Electrical Simulation of Thermocouple Indicating Devices – Measure	Type E (-200 to 0) °C (> 0 to 400) °C (>400 to 1 300) °C Type J (-210 to 0) °C (> 0 to 500) °C (> 500 to 1 000) °C (> 1 000 to 1 200) °C	0.57 °C 0.42 °C 0.44 °C 0.46 °C 0.42 °C 0.42 °C 0.44 °C	Portable Calibrator; WI-18-T02



**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
Electrical Simulation of Thermocouple Indicating Devices – Measure	Type K (-200 to 0) °C	0.48 °C	Portable Calibrator; WI-18-T02	
	(> 0 to 500) °C	0.42 °C		
	(> 500 to 1 000) °C	0.46 °C		
	(> 1 000 to 1 372) °C	0.52 °C		
	Type N (-200 to 0) °C	0.52 °C		
	(> 0 to 400) °C	0.43 °C		
	(> 400 to 1 300) °C	0.46 °C		
	Type R (0 to 500) °C	0.61 °C		
	(> 500 to 1 000) °C	0.47 °C		
	(> 1 000 to 1 767) °C	0.51 °C		
	Type S (0 to 500) °C	0.55 °C		
	(> 500 to 1 000) °C	0.56 °C		
	(> 1 000 to 1 767) °C	0.53 °C		
Type T (-200 to 0) °C	0.64 °C	Multifunction Calibrator; WI-18-T20		
(> 0 to 100) °C	0.45 °C			
(> 100 to 400) °C	0.42 °C			
Electrical Simulation of RTD Indicating Devices – Generate	Pt 385, 100 Ω (-200 to 0) °C		0.092 °C	
	(> 0 to 200) °C		0.11 °C	
	(> 200 to 850) °C		0.2 °C	
	Pt 392, 100 Ω (-200 to 0) °C		0.092 °C	
	(> 0 to 200) °C		0.11 °C	
	(> 200 to 850) °C		0.13 °C	
Electrical Simulation of RTD Indicating Devices – Measure	Pt 385, 100 Ω (-200 to 0) °C		0.071 °C	Digital Multimeter; WI-18-T22
	(> 0 to 200) °C		0.091 °C	
	(> 200 to 660) °C		0.19 °C	
	Pt 392, 100 Ω (-200 to 0) °C		0.071 °C	
	(> 0 to 200) °C	0.091 °C		
	(> 200 to 660) °C	0.12 °C		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices – Generate	Pt 385, 100 Ω		Portable Calibrator; WI-18-T03
	(-200 to 0) °C	0.11 °C	
	(> 0 to 200) °C	0.13 °C	
	(> 200 to 850) °C	0.21 °C	
	Pt 392, 100 Ω		
	(-200 to 0) °C	0.11 °C	
	(> 0 to 200) °C	0.13 °C	
	(> 200 to 850) °C	0.15 °C	
Electrical Simulation of RTD Indicating Devices – Measure	Pt 385, 100 Ω		Digital Multimeter; WI-18-T06
	(-200 to 0) °C	0.093 °C	
	(> 0 to 200) °C	0.11 °C	
	(> 200 to 850) °C	0.2 °C	
	Pt 392, 100 Ω		
	(-200 to 0) °C	0.093 °C	
	(> 0 to 200) °C	0.11 °C	
	(> 200 to 850) °C	0.14 °C	

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Caliper (External, Internal, Depth)	(0 to 150) mm	7.6 μm	Gauge Blocks; JIS B 7507-2016, WI-18-D01
	(> 150 to 200) mm	7.7 μm	
	(> 200 to 300) mm	7.8 μm	
	(> 300 to 450) mm	8.2 μm	
	(> 450 to 600) mm	9 μm	
	(> 600 to 1 000) mm	15 μm	
External Micrometer	Up to 25 mm	0.86 μm	Gauge Blocks; JIS B 7502-2016, WI-18-D02
	(> 25 to 50) mm	0.96 μm	
	(> 50 to 75) mm	1.1 μm	
	(> 75 to 100) mm	1.2 μm	
	(> 100 to 125) mm	1.2 μm	
	(> 125 to 150) mm	1.7 μm	
	(> 150 to 175) mm	1.8 μm	
	(> 175 to 200) mm	1.9 μm	
	(> 200 to 225) mm	2.2 μm	
	(> 225 to 250) mm	2.6 μm	
	(> 250 to 275) mm	2.7 μm	
(> 275 to 300) mm	2.8 μm		

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
External Micrometer	(> 300 to 325) mm (> 325 to 350) mm (> 350 to 375) mm (> 375 to 400) mm (> 400 to 425) mm (> 425 to 450) mm (> 450 to 475) mm (> 475 to 500) mm	2.9 μm 3.2 μm 3.3 μm 3.4 μm 3.5 μm 3.8 μm 3.9 μm 4 μm	Gauge Blocks; JIS B 7502-2016, WI-18-D02
Internal Micrometer	(5 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm (> 200 to 225) mm (> 225 to 250) mm (> 250 to 275) mm (> 275 to 300) mm (> 300 to 325) mm (> 325 to 350) mm (> 350 to 375) mm (> 375 to 400) mm (> 400 to 425) mm (> 425 to 450) mm (> 450 to 475) mm (> 475 to 500) mm	1.3 μm 1.4 μm 1.4 μm 1.5 μm 1.5 μm 2 μm 2.1 μm 2.1 μm 2.4 μm 2.8 μm 2.9 μm 2.9 μm 3.1 μm 3.4 μm 3.4 μm 3.4 μm 3.5 μm 3.6 μm 4 μm 4 μm 4.1 μm	Gauge Blocks; JIS B 7502-2016, WI-18-D08
Height Gauge	Up to 150 mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 450) mm	15 μm 15 μm 16 μm 19 μm	Gauge Blocks, Surface Plate; JIS B 7533-1997, WI-18-D04
Dial Gauge, Digital Indicator Gauge	Up to 25 mm	6.8 μm	Dial Calibrator; JIS B 7503-1997, WI-18-D23
Dial Gauge, Digital Indicator Gauge	Up to 12.5 mm (> 12.5 to 25) mm (> 25 to 50) mm	1.1 μm 1.6 μm 2.8 μm	Universal Length Measuring Machine; JIS B 7503-1997, WI-18-D14
Dial Test Gauge, Digital Test Indicator Gauge	Up to 1 mm	1.3 μm	Calibration Tester; JIS B 7533-1997, WI-18-D07

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dial Test Gauge, Digital Test Indicator Gauge	Up to 2 mm	0.82 $\mu\text{m}$	Universal Length Measuring Machine; JIS B 7533-1997, WI-18-D16
Feeler Gauge	(0.01 to 3) mm (> 3 to 20) mm	0.4 $\mu\text{m}$ 0.42 $\mu\text{m}$	Universal Length Measuring Machine; JIS B 7524-1992, WI-18-D24
Steel Rule	Up to 1 000 mm	32 $\mu\text{m}$	Linear Scale; JIS B 7516-1987, WI-18-D09
Measuring Tape	Up to 2 000 mm (> 2 000 to 5 000) mm (> 5 000 to 10 000) mm (> 10 000 to 20 000) mm	34 $\mu\text{m}$ 38 $\mu\text{m}$ 48 $\mu\text{m}$ 76 $\mu\text{m}$	Linear Scale; JIS B 7512-2005, WI-18-D10
Thickness Gauge	Up to 25 mm (> 25 to 50) mm	1.7 $\mu\text{m}$ 1.8 $\mu\text{m}$	Linear Scale; JIS B 7503-1997, WI-18-D17
Thread Plug Gauge	(1 to 10) mm (> 10 to 50) mm (> 50 to 110) mm	1.5 $\mu\text{m}$ 2.1 $\mu\text{m}$ 2.7 $\mu\text{m}$	Universal Length Measuring Machine; EURAMET cg-10, WI-18-D35
Thread Ring Gauge	(3.5 to 10) mm (> 10 to 50) mm (> 50 to 110) mm	1.3 $\mu\text{m}$ 1.7 $\mu\text{m}$ 3 $\mu\text{m}$	Universal Length Measuring Machine; EURAMET cg-10, WI-18-D36
Cylindrical Ring Gauge	(1.5 to 10) mm (> 10 to 50) mm (> 50 to 100) mm (> 100 to 120) mm	0.62 $\mu\text{m}$ 0.78 $\mu\text{m}$ 1.2 $\mu\text{m}$ 1.2 $\mu\text{m}$	Universal Length Measuring Machine; JIS B 7420-1997, WI-18-D11
Cylindrical Plug Gauge, Pin Gauge, Wires	(0.1 to 10) mm (> 10 to 50) mm (> 50 to 110) mm	0.44 $\mu\text{m}$ 0.65 $\mu\text{m}$ 1.1 $\mu\text{m}$	Universal Length Measuring Machine; JIS B 7420-1997, WI-18-D12
<sup>2</sup> Coating Thickness Gauge	50 $\mu\text{m}$ 100 $\mu\text{m}$ 250 $\mu\text{m}$ 500 $\mu\text{m}$ 1 000 $\mu\text{m}$	0.47 $\mu\text{m}$ 0.48 $\mu\text{m}$ 0.55 $\mu\text{m}$ 0.74 $\mu\text{m}$ 1.25 $\mu\text{m}$	Standard Foils; WI-18-D13
Chamfer Gauge	(0.1 to 50) mm	2.3 $\mu\text{m}$	Microscope; WI-18-D18

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Bore Gauge, Cylinder Gauge	Up to 18 mm (> 18 to 35) mm (> 35 to 60) mm (> 60 to 100) mm	0.58 µm 0.74 µm 0.84 µm 1.1 µm	Universal Length Measuring Machine; JIS B 7515-1982, WI-18-D19
Angle/Bevel Gauge	Up to 90°	0.077°	Comparison to Angle Block; WI-18-D22
Linear Scale	Up to 150 mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 450) mm (> 450 to 600) mm (> 600 to 1 000) mm	2.2 µm 2.3 µm 2.6 µm 3.2 µm 3.8 µm 5.9 µm	Gauge Blocks; WI-18-D25
Measuring Microscope, Tool Maker Microscope	Up to 100 mm (> 100 to 300) mm	1.2 µm 2.5 µm	Glass Scale; JIS B 7153-1999, WI-18-D26
Profile Projector X-Y Scale Linearity	Up to 100 mm (> 100 to 300) mm	1.2 µm 2.5 µm	Glass Scale; JIS B 7184-1999, WI-18-D26
Pitch Gauge	Up to 25 mm	2.3 µm	Measuring Microscope; WI-18-D27
Radius Gauge	Up to 50 mm (> 50 to 100) mm	2.3 µm 2.4 µm	Measuring Microscope; WI-18-D29
Thickness Plate	(0.025 to 3) mm (> 3 to 20) mm	0.4 µm 0.42 µm	Universal Length Measuring Machine; JIS B 7524-1992, WI-18-D30
Ultrasonic Thickness Gauge	Up to 50 mm (> 50 to 100) mm	1.8 µm 2.1 µm	Gauge Blocks; WI-18-D31
Holtest, 3-point Internal Micrometer	(3 to 14) mm (> 14 to 20) mm (> 20 to 40) mm (> 40 to 50) mm (> 50 to 70) mm	1.6 µm 1.6 µm 1.9 µm 2 µm 2.6 µm	Standard Ring Gauge; WI-18-D32
Taper Gauge	Up to 50 mm (> 50 to 100) mm	2.3 µm 2.4 µm	Measuring Microscope; WI-18-D33
Test Sieve	Up to 50 mm	2.3 µm	Measuring Microscope; WI-18-D34
Roller Counter, Length Meter Outside Diameter	(28 to 200) mm	38 µm	Pi Tape, WI-18-D20

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometer Head	Up to 25 mm (> 25 to 50) mm	0.86 $\mu\text{m}$ 0.95 $\mu\text{m}$	Gauge Blocks; JIS B 7502-2016, WI-18-D37
Depth Micrometer	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm (> 100 to 125) mm (> 125 to 150) mm (> 150 to 175) mm (> 175 to 200) mm (> 200 to 225) mm (> 225 to 250) mm (> 250 to 275) mm (> 275 to 300) mm (> 300 to 325) mm (> 325 to 350) mm (> 350 to 375) mm (> 375 to 400) mm (> 400 to 425) mm (> 425 to 450) mm (> 450 to 475) mm (> 475 to 500) mm	0.86 $\mu\text{m}$ 0.96 $\mu\text{m}$ 1.1 $\mu\text{m}$ 1.2 $\mu\text{m}$ 1.2 $\mu\text{m}$ 1.7 $\mu\text{m}$ 1.8 $\mu\text{m}$ 1.9 $\mu\text{m}$ 2.2 $\mu\text{m}$ 2.6 $\mu\text{m}$ 2.7 $\mu\text{m}$ 2.8 $\mu\text{m}$ 2.9 $\mu\text{m}$ 3.2 $\mu\text{m}$ 3.3 $\mu\text{m}$ 3.4 $\mu\text{m}$ 3.5 $\mu\text{m}$ 3.8 $\mu\text{m}$ 3.9 $\mu\text{m}$ 4 $\mu\text{m}$	Gauge Blocks; JIS B 7544, WI-18-D39
Depth Gauge	Up to 150 mm (> 150 to 200) mm (> 200 to 300) mm (> 300 to 450) mm	15 $\mu\text{m}$ 15 $\mu\text{m}$ 16 $\mu\text{m}$ 19 $\mu\text{m}$	Gauge Blocks, Surface Plate; JIS B 7518, WI-18-D03

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pneumatic Pressure Measuring Instrument (Bourdon or Electrical) (Air or N <sub>2</sub> )	Up to 100 kPa (> 100 to 400) kPa (> 400 to 2 000) kPa	52 Pa 0.11 kPa 0.52 kPa	Druck DPI 510 Pressure Controller, Druck DPI 610 Pressure Calibrator; WK-18-P01 (DKD-R 6-1)
Pneumatic Vacuum Measuring Instrument (Bourdon or Electrical) (Air)	(-85 to 0) kPa	0.28 kPa	Druck DPI 610 Pressure Calibrator; WK-18-P01 (DKD-R 6-1)



**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Hydraulic Pressure Measuring Instrument (Bourdon or Electrical) (Oil or H <sub>2</sub> O)	Up to 14 MPa (> 14 to 41.3) MPa	7.2 kPa 43 kPa	Meriam Meri-Cal II Pressure Calibrator, Druck DPI 601 Pressure Indicator/Calibrator; WK-18-P01 (DKD-R 6-1)
Pneumatic Pressure Transmitter with Electrical Output (Air or N <sub>2</sub> )	Up to 100 kPa (> 100 to 400) kPa (> 400 to 2 000) kPa	96 Pa 0.16 kPa 0.78 kPa	Druck DPI 510 Pressure Controller, Druck DPI 610 Pressure Calibrator; WK-18-P02 (DKD-R 6-1)
Pneumatic Vacuum Transmitter with Electrical Output (Air)	(-85 to 0) kPa	0.26 kPa	Druck DPI 610 Pressure Calibrator; WK-18-P02 (DKD-R 6-1)
Pneumatic Hydraulic Pressure Transmitter with Electrical Output (Oil or H <sub>2</sub> O)	Up to 14 MPa (> 14 to 41.3) MPa	8.2 kPa 44 kPa	Meriam Meri-Cal II Pressure Calibrator, Druck DPI 601 Pressure Indicator/Calibrator; WK-18-P02 (DKD-R 6-1)
Pneumatic Pressure Switch (Air or N <sub>2</sub> )	Up to 100 kPa (> 100 to 400) kPa (> 400 to 2 000) kPa	51 Pa 0.11 kPa 0.51 kPa	Druck DPI 510 Pressure Controller, Druck DPI 610 Pressure Calibrator; WK-18-P03 (DKD-R 6-1)
Pneumatic Vacuum Switch (Air)	(-85 to 0) kPa	0.26 kPa	Druck DPI 610 Pressure Calibrator; WK-18-P03 (DKD-R 6-1)
Pneumatic Hydraulic Pressure Switch (Oil or H <sub>2</sub> O)	Up to 14 MPa (> 14 to 41.3) MPa	7.1 kPa 42 kPa	Meriam Meri-Cal II Pressure Calibrator, Druck DPI 601 Pressure Indicator/Calibrator; WK-18-P03 (DKD-R 6-1)
Force Measuring Tester (Tension and Compression)	Up to 200 N (> 200 to 500) N (> 500 to 2 000) N (> 2 000 to 4 000) N (> 4 000 to 40 000) N	0.6 N 0.96 N 3.1 N 6 N 60 N	Load Cell with Indicator; WI-18-M04

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force Gauge, Push-Pull Gauge	Up to 0.98 N (> 0.98 to 4.89) N (> 4.89 to 9.8) N (> 9.8 to 19.6) N (> 19.6 to 29.3) N (> 29.3 to 48.9) N (> 48.9 to 97.8) N (> 97.8 to 195.6) N (> 195.6 to 293.4) N (> 293.4 to 489.1) N	1.3 mN 4.2 mN 13 mN 19 mN 27 mN 42 mN 0.13 N 0.19 N 0.27 N 0.42 N	OIML Class F1 Weights; WI-18-M03
<sup>3</sup> Electronic Balance	Up to 1 g (> 1 to 2) g (> 2 to 5) g (> 5 to 10) g (> 10 to 20) g (> 20 to 50) g (> 50 to 100) g (> 100 to 150) g (> 150 to 200) g (> 200 to 220) g (> 220 to 300) g (> 300 to 500) g (> 500 to 600) g (> 600 to 800) g (> 800 to 1 000) g	88 µg 89 µg 90 µg 92 µg 98 µg 0.12 mg 0.17 mg 0.24 mg 0.3 mg 0.34 mg 1.1 mg 1.3 mg 1.5 mg 1.8 mg 3 mg	OIML Class E2, F1, and M1 Weights, internal procedure WI-18-M01, and UKAS Lab 14 utilized in the calibration of the weighing system.
<sup>3</sup> Electronic Balance	(> 1 to 2) kg (> 2 to 5) kg (> 5 to 30) kg (> 30 to 50) kg (> 50 to 100) kg (> 100 to 150) kg (> 150 to 300) kg (> 300 to 600) kg (> 600 to 1 000) kg	9.9 mg 13 mg 0.92 g 0.95 g 1.1 g 4.7 g 9.7 g 20 g 42 g	OIML Class E2, F1, and M1 Weights, internal procedure WI-18-M01, and UKAS Lab 14 utilized in the calibration of the weighing system.
Durometer Spring Force Shore A, B, E, O Shore C, D, DO Shore FO	(0 to 100) Duro (0 to 100) Duro (0 to 100) Duro	0.4 Duro 0.16 Duro 0.78 Duro	Partial Direct Verification per WK-18-M05 using Digital Force Gauge

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Indicating Devices (Wrenches, Screwdrivers, etc.)	Up to 2 N·m (> 2 to 10) N·m (> 10 to 50) N·m (> 50 to 200) N·m (> 200 to 500) N·m (> 500 to 1 000) N·m	0.012 N·m 0.022 N·m 0.14 N·m 0.53 N·m 1.3 N·m 2.6 N·m	Torque Calibrator; WI-18-Q01
Torque Meters, Torque Testers	Up to 1.222 69 N·m (0.489 1 to 4.890 8) N·m (> 0.098 to 19.563) N·m (> 0.244 5 to 48.9) N·m (> 0.097 8 to 19.563) N·m (> 0.489 to 244.54) N·m	0.001 4 N·m 0.004 2 N·m 0.017 N·m 0.042 N·m 0.017 N·m 0.21 N·m	Torque Arms. Calibration Weights; WI-18-Q02
Single-channel Piston Pipettes, Multi-channel Piston Pipettes, Positive Displacement Pipettes	up to 500 µl (> 500 to 1 000) µl (> 1 to 2) ml (> 2 to 5) ml (> 5 to 10) ml (> 10 to 20) ml (> 20 to 50) ml (> 50 to 100) ml (> 100 to 200) ml	0.32 µl 0.33 µl 0.39 µl 0.67 µl 1.2 µl 2.4 µl 5.9 µl 12 µl 23 µl	Electronic Balance; Based on ISO 8655-6:2000 ASTM E542-01, WI-18-V01
Volumetric Glassware, Burette Volumetric Pipette, Measuring Pipette, Volumetric Flask, Graduated Cylinder, Beaker, Piston Burette, Dilutor, Dispenser, Specific Gravity Bottle	up to 500 µl (> 500 to 1 000) µl (> 1 to 2) ml (> 2 to 5) ml (> 5 to 10) ml (> 10 to 20) ml (> 20 to 50) ml (> 50 to 100) ml (> 100 to 200) ml (> 200 to 1 000) ml (> 1 to 5) l	0.31 µl 0.33 µl 0.39 µl 0.66 µl 1.2 µl 2.3 µl 5.8 µl 12 µl 24 µl 0.12 ml 0.58 ml	Electronic Balance; Based on ISO 8655-6:2000 ASTM E542-01, WI-18-V02
Anemometer	Up to 2.5 m/s (> 2.5 to 5) m/s (> 5 to 10) m/s (> 10 to 15) m/s	0.18 m/s 0.19 m/s 0.22 m/s 0.25 m/s	Comparison to Master Anemometer, Wind Tunnel; WI-18-L06

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Viscosity Cup, Density Cup (20 to 50) °C	Kinematic Viscosity (7.4 to 90.1) mm <sup>2</sup> /s (57.61 to 308.8) mm <sup>2</sup> /s (200 to 1 038) mm <sup>2</sup> /s (315 to 1 760) mm <sup>2</sup> /s (546.2 to 3 335) mm <sup>2</sup> /s (1 352 to 10 520) mm <sup>2</sup> /s (5 081 to 59 080) mm <sup>2</sup> /s	0.59 % of reading 0.62 % of reading 0.62 % of reading 0.79 % of reading 0.79 % of reading 0.79 % of reading 0.79 % of reading	Accredited Viscosity Oil Solution, Temperature Probe; WI-18-L01
Dial/Digital Viscosity Meters (20 to 100) °C	Dynamic Viscosity (2.083 to 19.01) mPa·s (3.95 to 48.08) mPa·s (4.496 to 77.7) mPa·s (8.58 to 167.7) mPa·s (8.95 to 271.3) mPa·s (27.41 to 876.1) mPa·s (39.82 to 1 490) mPa·s (62.89 to 2 832) mPa·s (121.3 to 9 087) mPa·s (270.7 to 52 630) mPa·s	0.46 % of reading 0.48 % of reading 0.48 % of reading 0.48 % of reading 0.47 % of reading 0.48 % of reading 0.47 % of reading 0.48 % of reading 0.48 % of reading 0.48 % of reading	Accredited Viscosity Oil Solution, Temperature Probe; WI-18-L02
<sup>4</sup> Stormer Viscosity Meter (20 to 80) °C	Dynamic Viscosity (27 to 43.4) KU (41.8 to 81.3) KU (47 to 120.6) KU	0.37 % of reading 0.36 % of reading 0.44 % of reading	Accredited Viscosity Oil Solution, Temperature Probe; WI-18-L03

**Photometry and Radiometry**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
UV/VIS Spectrophotometer Wavelength	279.3 nm 360.9 nm 453.65 nm 536.45 nm 637.65 nm	0.23 nm 0.23 nm 0.23 nm 0.23 nm 0.23 nm	Standard Neutral Density Glass Filter, Holmium Oxide Glass Filter Base; Based on ASTM E275-01, WI-18-L04
Photometric	≤ 0.452 Abs ≤ 0.776 5 Abs ≤ 1.533 1 Abs	0.003 3 Abs 0.004 8 Abs 0.008 9 Abs	
<sup>4</sup> Gloss Meter (20°, 60°, 80°)	(0 to 100) GU	0.7 GU	Standard Gloss Tiles; WI-18-L08

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Digital Thermometer with RTD/Thermistor Sensor	(-20 to 0) °C (> 0 to 50) °C (> 50 to 200) °C (> 200 to 400) °C	0.076 °C 0.074 °C 0.075 °C 0.076 °C	Comparison to PRT with Indicator, Liquid Bath, Dry Block; WI-18-T05
Temperature Element RTD Sensor	(-20 to 0) °C (> 0 to 50) °C (> 50 to 200) °C (> 200 to 400) °C	0.076 °C 0.075 °C 0.075 °C 0.076 °C	Comparison to PRT with Indicator, Portable Calibrator, Liquid Bath, Dry Block; WI-18-T27
Temperature Transmitter RTD Sensor	(-20 to 0) °C (> 0 to 50) °C (> 50 to 200) °C (> 200 to 400) °C	0.076 °C 0.076 °C 0.1 °C 0.17 °C	Comparison to PRT with Indicator, Liquid Bath, Dry Block; WI-18-T07
Digital Thermometer with Thermocouple Sensor (Type E, J, K, N, T)	(-20 to 0) °C (> 0 to 50) °C (> 50 to 100) °C (> 100 to 200) °C (> 200 to 300) °C (> 300 to 400) °C	0.2 °C 0.22 °C 0.26 °C 0.4 °C 0.56 °C 0.73 °C	Comparison to PRT with Indicator, Liquid Bath, Dry Block; WI-18-T04
Digital Thermometer with Thermocouple Sensor (Type E, J, K, N)	(400 to 600) °C (> 600 to 900) °C (> 900 to 1 200) °C	3.1 °C 3.6 °C 3.9 °C	Comparison to Type S Thermocouple Probe with Indicator, Dry Block Calibrator; WI-18-T04
Digital Thermometer with Thermocouple Sensor (Type R, S)	(-20 to 50) °C (> 50 to 100) °C (> 100 to 200) °C (> 200 to 300) °C (> 300 to 400) °C	0.2 °C 0.2 °C 0.23 °C 0.26 °C 0.31 °C	Comparison to PRT with Indicator, Liquid Bath, Dry Block; WI-18-T04
Digital Thermometer with Thermocouple Sensor (Type R, S)	(> 400 to 600) °C (> 600 to 900) °C (> 900 to 1 200) °C	2.9 °C 3.3 °C 3.4 °C	Comparison to Type S Thermocouple Probe with Indicator, Dry Block Calibrator; WI-18-T04

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Element Thermocouple Sensor (Type E, J, K, N, T)	(-20 to 0) °C (> 0 to 50) °C (> 50 to 100) °C (> 100 to 200) °C (> 200 to 300) °C (> 300 to 400) °C	0.2 °C 0.22 °C 0.26 °C 0.4 °C 0.56 °C 0.73 °C	Comparison to PRT with Indicator, Portable Calibrator, Liquid Bath, Dry Block; WI-18-T26
Temperature Element Thermocouple Sensor (Type E, J, K, N)	(> 400 to 600) °C (> 600 to 900) °C (> 900 to 1 200) °C	3.1 °C 3.6 °C 3.9 °C	Comparison to Type S Thermocouple Probe with Indicator, Portable Calibrator, Dry Block Calibrator; WI-18-T26
Temperature Element Thermocouple Sensor (Type R, S)	(-20 to 0) °C (> 0 to 50) °C (> 50 to 100) °C (> 100 to 200) °C (> 200 to 300) °C (> 300 to 400) °C	0.2 °C 0.2 °C 0.2 °C 0.23 °C 0.26 °C 0.31 °C	Comparison to PRT with Indicator, Portable Calibrator, Liquid Bath, Dry Block; WI-18-T26
Temperature Element Thermocouple Sensor (Type R, S)	(> 400 to 600) °C (> 600 to 900) °C (> 900 to 1 200) °C	2.9 °C 3.3 °C 3.4 °C	Comparison to Type S Thermocouple Probe with Indicator, Portable Calibrator, Dry Block Calibrator; WI-18-T26
Temperature Transmitter Thermocouple Sensor (Type E, J, K, N, T)	(-20 to 0) °C (> 0 to 50) °C (> 50 to 100) °C (> 100 to 200) °C (> 200 to 300) °C (> 300 to 400) °C	0.21 °C 0.23 °C 0.27 °C 0.41 °C 0.57 °C 0.74 °C	Comparison to PRT with Indicator, Liquid Bath, Dry Block; WI-18-T10
Temperature Transmitter Thermocouple Sensor (Type E, J, K, N)	(> 400 to 600) °C (> 600 to 900) °C (> 900 to 1 200) °C	2.9 °C 3.6 °C 3.9 °C	Comparison to Type S Thermocouple Probe with Indicator, Dry Block Calibrator; WI-18-T10
Liquid Bath	(-20 to 200) °C	0.2 °C	Data Acquisition Unit with 4-wire RTD; WI-18-T11
Temperature Enclosures (Chambers)	-20 °C (> 20 to 0) °C (> 0 to 100) °C (> 100 to 200) °C	0.4 °C 0.33 °C 0.34 °C 0.52 °C	Data Acquisition Unit with 4-wire RTD; EURAMET cg-20 WI-18-T11



**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Enclosures (Chambers)	-20 °C (> 20 to 0) °C (> 0 to 100) °C (> 100 to 200) °C	0.45 °C 0.4 °C 0.44 °C 0.74 °C	Data Acquisition Unit with Type T Thermocouple Probe; EURAMET cg-20 WI-18-T11
Humidity Chamber	(30 to 90) %RH	1.1 % RH	Vaisala HMP234 Temp/Humidity Transmitter, Vaisala HC520 Temp/Humidity Sensor; WI-18-T28
Auto Clave	(100 to 140) °C	0.24 °C	Data Acquisition Unit with 4-wire RTD; BSI BS 2645:5, WI-18-T25
Auto Clave	(100 to 140) °C	0.52 °C	Data Acquisition Unit with Type T Thermocouple Probe; BSI BS 2645:5, WI-18-T25
Dry Block Calibrator	(-20 to 200) °C (> 200 to 400) °C	0.091 °C 0.093 °C	Comparison to PRT with Indicator; WI-18-T15
Dry Block Calibrator	(> 400 to 600) °C (> 600 to 1 200) °C	2.8 °C 3.2 °C	Comparison to Type S Thermocouple Probe with Indicator; WI-18-T15
Dial/Digital Temperature Gauge	(-20 to 400) °C	0.098 °C	Comparison to PRT with Indicator, Liquid Bath, Dry Block Calibrator; WI-18-T17
Thermohygrometer Temperature  Humidity	(-20 to 100) °C  (30 to 90) %RH	0.38 °C  1.1 %RH	Comparison to Vaisala HMP234 Temp/Humidity Transmitter, Vaisala HC520 Temp/Humidity Sensor; WI-18-T18

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Liquid-in-Glass Thermometer Total Immersion	(-20 to 200) °C	0.061 °C	Comparison to PRT with Indicator, Liquid Baths; WI-18-T09
Partial Immersion	(-20 to 200) °C	0.086 °C	
Muffle Furnace	(100 to 300) °C	0.83 °C	Comparison to PRT with Indicator; WI-18-T13
Muffle Furnace	(> 300 to 600) °C (> 600 to 900) °C (> 900 to 1 200) °C	3.2 °C 3.5 °C 3.6 °C	Comparison to Type S Thermocouple Probe with Indicator; WI-18-T13
Infrared Thermometer	(35 to 100) °C (> 100 to 200) °C (> 200 to 350) °C	0.51 °C 0.64 °C 1.1 °C	VOLTCRAFT IRS-350 Blackbody Calibrator (flat plate), characterized with Fluke 1502A with PRT; WI-18-T08; $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$
Thermocouple Extension Wire Type E, J, K, N, T  Type R, S	(20 to 40) °C  (20 to 40) °C	0.12 °C  0.1 °C	Comparison to Digital Thermometer with RTD Probe, Digital Multimeter, Liquid Baths; EUROMET cg-8, ASTM 220, ASTM 230, WI-18-T16

**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Generate	(0.2 to 10) V (> 0.1 to 20) Hz (> 20 to 200) Hz > 200 Hz to 2 kHz (> 2 to 20) kHz (> 20 to 200) kHz > 200 kHz to 2 MHz (> 2 to 20) MHz	58 $\mu\text{Hz}/\text{Hz} + 6 \mu\text{Hz}$ 58 $\mu\text{Hz}/\text{Hz} + 61 \mu\text{Hz}$ 58 $\mu\text{Hz}/\text{Hz} + 0.62 \text{ mHz}$ 58 $\mu\text{Hz}/\text{Hz} + 6 \text{ mHz}$ 58 $\mu\text{Hz}/\text{Hz} + 61 \text{ mHz}$ 58 $\mu\text{Hz}/\text{Hz} + 0.62 \text{ Hz}$ 58 $\mu\text{Hz}/\text{Hz} + 6 \text{ Hz}$	Metrix CX 1651 Multifunction Calibrator; WI-18-E24



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**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure	(> 0.2 to 750) V (3 to 5) Hz (> 5 to 10) Hz (> 10 to 40) Hz (> 40 to 300) Hz > 300 Hz to 300 kHz > 300 kHz to 1 MHz	0.82 mHz/Hz + 5.9 µHz 0.47 mHz/Hz + 59 µHz 0.24 mHz/Hz + 59 µHz 82 µHz/Hz + 0.61 mHz 82 µHz/Hz + 0.61 Hz 82 µHz/Hz + 5.9 Hz	Rigol DM3068 6.5 Digit Multimeter; WI-18-E37
Frequency – Measure	> 0.1 Hz to 1 GHz	27 µHz/Hz	Anritsu MF1601A Frequency Counter; WI-18-E09
Pulse – Generate	(1 to 9 999 999) count	0.58 count	Metrix CX 1651 Multifunction Calibrator; WI-18-E46
Pulse – Generate	(1 to 9 999 999) count	0.65 count	Portable Calibrator; WI-18-E48
Pulse – Measure	(1 to 9 999 999) count	0.58 count	Anritsu MF1601A Frequency Counter; WI-18-E47
Pulse – Measure	(1 to 9 999 999) count	0.65 count	Portable Calibrator; WI-18-E48
Quartz Stopwatch, Timer	32 Hz 64 Hz 128 Hz 256 Hz 512 Hz 1 024 Hz	32 µHz 76 µHz 77 µHz 84 µHz 0.11 mHz	Anritsu MF1601A Frequency Counter; WI-18-E14 by measuring the Time Base of the unit under calibration.
Timer	Up to 24 h	20 ms	Comparison to Digital Stopwatch; WI-18-E51
<sup>4</sup> Non-contact Tachometer	(6 to 100) rpm (> 100 to 1 000) rpm (> 1 000 to 100 000) rpm	0.005 9 rpm 0.059 rpm 0.59 rpm	Metrix CX 1651 Multifunction Calibrator, LED Box; WI-18-E17

**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<sup>4</sup> Centrifuge, Stroboscope	(6 to 600) rpm	1.4 rpm	Comparison to Digital Tachometer; WI-18-E30
	(> 600 to 1 200) rpm	2.8 rpm	
	(> 1 200 to 1 800) rpm	4.2 rpm	
	(> 1 800 to 2 400) rpm	5.6 rpm	
	(> 2 400 to 3 000) rpm	7 rpm	
	(> 3 000 to 6 000) rpm	14 rpm	
	(> 6 000 to 12 000) rpm	28 rpm	
	(> 12 000 to 18 000) rpm	42 rpm	
	(> 18 000 to 24 000) rpm	56 rpm	
<sup>4</sup> Centrifuge, Stroboscope	(6 to 100) rpm	0.000 71 rpm	Anritsu MF1601A Frequency Counter; WI-18-E52 by direct measuring
	(> 100 to 1 000) rpm	0.007 1 rpm	
	(> 1 000 to 100 000) rpm	0.071 rpm	

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. The nominal values listed are approximate. The actual values from the solutions will be used during calibration.
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. KU = Krebs units; GU: gloss unit; rpm = revolutions per minute.
5. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-3255.



Jason Stine, Vice President