



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Advantage Center Co., Ltd.
59/494 Moo 6, Frakham Road, T. Kukhot, Lumlookkar,
Pathumthani 12130 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.

Jason Stine, Vice President

Expiry Date: 21 March 2027

Certificate Number: AC-2662



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

Advantage Center Co., Ltd.

59/494 Moo 6, Frakham Road, T. Kukhot, Lumlookkar,
Pathumthani 12130 Thailand

Pornsak Suksawaeng +66 29873248-50
Pornsak.accl2662@gmail.com www.accl-cal.com

CALIBRATION

Valid to: **March 21, 2027**

Certificate Number: **AC-2662**

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Sound Level Meter	1 kHz 94 dB 114 dB	0.88 dB 0.88 dB	Comparison to Sound Calibrator
¹ Vibration Meter (RMS) Acceleration (160 Hz)	10 m/s ²	3.3 % of reading	Comparison to Vibration Calibrator
Velocity (160 Hz)	10 mm/s	3.3 % of reading	
Displacement (160 Hz)	10 μs	3.3 % of reading	

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ pH Meter	4.00 pH 7.00 pH 10.00 pH	0.01 pH 0.01 pH 0.017 pH	Comparison to Accredited pH Solution
¹ Conductivity Meter	@25 °C 50 μS/cm 84 μS/cm 1 413 μS/cm 12.88 mS/cm 111.3 mS/cm	0.7 μS/cm 1.2 μS/cm 20 μS/cm 0.18 mS/cm 1.6 mS/cm	Comparison to Accredited Conductivity Solution

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Turbidity Meter	10 NTU 15 NTU 20 NTU 50 NTU 100 NTU 500 NTU 800 NTU 1 000 NTU	0.06 NTU 0.17 NTU 0.12 NTU 0.31 NTU 0.99 NTU 3.1 NTU 5.1 NTU 7.1 NTU	Comparison to Accredited Turbidity Solution
¹ Refractometer	10 % Brix 20 % Brix 30 % Brix 50 % Brix	0.07 % Brix 0.08 % Brix 0.095 % Brix 0.12 % Brix	Comparison to Accredited Sucrose Solution
¹ Refractometer Refractive Index	1.347 83 nD 1.363 84 nD 1.381 13 nD 1.420 09 nD	0.000 21 nD 0.000 21 nD 0.000 21 nD 0.000 21 nD	Comparison to Accredited Sucrose Solution
¹ Total Dissolved Solids (TDS) Meter	1 000 mg/L	31 mg/L	Comparison to Accredited TDS Solution

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ DC Voltage – Source	(0 to < 330) mV 330 mV to < 3.3 V (3.3 to < 33) V (33 to < 330) V (330 to 1 000) V	48 μ V/V + 9 μ V 40 μ V/V + 60 μ V 40 μ V/V + 0.6 mV 45 μ V/V + 6 mV 45 μ V/V + 60 mV	Comparison to Fluke 5500A Multiproduct Calibrator
¹ DC Current – Source	Up to < 3.3 mA (3.3 to < 33) mA (33 to < 330) mA (0.33 to < 2.2) A (2.2 to 11) A	0.11 mA/A + 85 nA 80 μ A/A + 0.65 μ A 80 μ A/A + 8 μ A 0.25 mA/A + 85 μ A 0.47 mA/A + 0.75 mA	Comparison to Fluke 5500A Multiproduct Calibrator
¹ DC Current Clamp-on Meters – Source	(10 to < 16.5) A (16.5 to < 150) A (150 to 550) A	5.8 mA/A + 0.07 A 5.9 mA/A + 0.2 A 5.9 mA/A + 0.6 A	Comparison to Fluke 5500A Multiproduct Calibrator, 50-turn Coil

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ AC Voltage – Source	(1 to < 33) mV		Comparison to Fluke 5500A Multiproduct Calibrator
	(10 to 45) Hz	2.8 mV/V + 16 μ V	
	> 45 Hz to 10 kHz	1.2 mV/V + 16 μ V	
	(> 10 to 20) kHz	1.6 mV/V + 16 μ V	
	(> 20 to 50) kHz	2 mV/V + 16 μ V	
	(> 50 to 100) kHz	2.8 mV/V + 26 μ V	
	(> 100 to 450) kHz	8 mV/V + 50 μ V	
	(33 to < 330) mV		
	(10 to 45) Hz	2 mV/V + 20 μ V	
	> 45 Hz to 10 kHz	0.4 mV/V + 20 μ V	
	(> 10 to 20) kHz	0.8 mV/V + 20 μ V	
	(> 20 to 50) kHz	1.3 mV/V + 32 μ V	
	(> 50 to 100) kHz	1.9 mV/V + 0.15 mV	
	(> 100 to 450) kHz	5.5 mV/V + 0.3 mV	
	(0.33 to < 3.3) V		
	(10 to 45) Hz	1.2 mV/V + 0.21 mV	
	> 45 Hz to 10 kHz	0.3 mV/V + 0.1 mV	
	(> 10 to 20) kHz	0.7 mV/V + 80 μ V	
	(> 20 to 50) kHz	1.1 mV/V + 0.25 mV	
	(> 50 to 100) kHz	1.9 mV/V + 1.4 mV	
	(> 100 to 450) kHz	4 mV/V + 2.6 mV	
	(3.3 to < 33) V		
	(10 to 45) Hz	1.2 mV/V + 2.2 mV	
	> 45 Hz to 10 kHz	0.32 mV/V + 0.75 mV	
	(> 10 to 20) kHz	0.63 mV/V + 2.2 mV	
	(> 20 to 50) kHz	1.5 mV/V + 4 mV	
	(> 50 to 90) kHz	1.9 mV/V + 14 mV	
	(33 to < 330) V		
	45 Hz to 1 kHz	0.4 mV/V + 7.8 mV	
	(> 1 to 10) kHz	0.7 mV/V + 13 mV	
	(> 10 to 18) kHz	0.7 mV/V + 27 mV	
	(330 to 1 000) V		
	45 Hz to 1 kHz	0.4 mV/V + 85 mV	
	(> 1 to 5) kHz	1.6 mV/V + 0.11 V	
	(> 5 to 10) kHz	1.6 mV/V + 0.4 V	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ AC Current – Source	(29 to < 330) μ A		Comparison to Fluke 5500A Multiproduct Calibrator
	(20 to 45) Hz	2 mA/A + 0.12 μ A	
	> 45 Hz to 1 kHz	1 mA/A + 0.2 μ A	
	(> 1 to 5) kHz	3.2 mA/A + 0.12 μ A	
	(> 5 to 10) kHz	9.8 mA/A + 0.12 μ A	
	(0.33 to < 3.3) mA		
	(20 to 45) Hz	1.6 mA/A + 0.25 μ A	
	> 45 Hz to 1 kHz	0.8 mA/A + 0.25 μ A	
	(> 1 to 5) kHz	1.6 mA/A + 0.25 μ A	
	(> 5 to 10) kHz	4.4 mA/A + 0.25 μ A	
	(3.3 to < 33) mA		
	(20 to 45) Hz	1.6 mA/A + 2.5 μ A	
	> 45 Hz to 1 kHz	0.7 mA/A + 2.5 μ A	
	(> 1 to 5) kHz	1.6 mA/A + 2.5 μ A	
	(> 5 to 10) kHz	4.7 mA/A + 2.5 μ A	
	(33 to < 330) mA		
	(20 to 45) Hz	1.6 mA/A + 25 μ A	
	> 45 Hz to 1 kHz	0.7 mA/A + 25 μ A	
	(> 1 to 5) kHz	1.6 mA/A + 25 μ A	
	(> 5 to 10) kHz	4.7 mA/A + 25 μ A	
¹ AC Current Clamp-on Meters – Source	(0.33 to < 2.2) A		Comparison to Fluke 5500A Multiproduct Calibrator, 50-turn Coil
	(10 to 45) Hz	1.6 mA/A + 0.25 mA	
	> 45 Hz to 1 kHz	0.78 mA/A + 0.25 mA	
	(> 1 to 5) kHz	6 mA/A + 0.25 mA	
	(2.2 to 11) A		
	(45 to 65) Hz	0.5 mA/A + 2 mA	
	(> 65 to 500) Hz	0.8 mA/A + 2 mA	
	> 500 Hz to 1 kHz	2.6 mA/A + 2 mA	
	(10 to < 16.5) A		
	(45 to 65) Hz	6.6 mA/A + 0.09 A	
	(> 65 to 440) Hz	12 mA/A + 0.07 A	
	(16.5 to < 150) A		
	(45 to 65) Hz	6.5 mA/A + 0.3 A	
	(> 65 to 440) Hz	12 mA/A + 0.3 A	
	(150 to 550) A		
	(45 to 65) Hz	6.5 mA/A + 1.1 A	
	(> 65 to 100) Hz	12 mA/A + 1.1 A	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Resistance – Source (Simulation)	(0 to < 11) Ω (11 to < 33) Ω (33 to < 110) Ω (110 to < 330) Ω 330 Ω to < 1.1 k Ω (1.1 to < 3.3) k Ω (3.3 to < 11) k Ω (11 to < 33) k Ω (33 to < 110) k Ω (110 to < 330) k Ω 330 k Ω to < 1.1 M Ω (1.1 to < 3.3) M Ω (3.3 to < 11) M Ω (11 to < 33) M Ω (33 to 100) M Ω	0.1 m Ω/Ω + 8.5 m Ω 0.1 m Ω/Ω + 15 m Ω 70 $\mu\Omega/\Omega$ + 15 m Ω 70 $\mu\Omega/\Omega$ + 15 m Ω 70 $\mu\Omega/\Omega$ + 0.1 Ω 70 $\mu\Omega/\Omega$ + 0.1 Ω 70 $\mu\Omega/\Omega$ + 0.9 Ω 70 $\mu\Omega/\Omega$ + 0.9 Ω 90 $\mu\Omega/\Omega$ + 7.5 Ω 0.1 m Ω/Ω + 9 Ω 0.13 m Ω/Ω + 80 Ω 0.13 m Ω/Ω + 0.1 k Ω 0.48 m Ω/Ω + 1 k Ω 0.8 m Ω/Ω + 1.3 k Ω 0.4 m Ω/Ω + 4.3 k Ω	Comparison to Fluke 5500A Multiproduct Calibrator
¹ Resistance – Source (Variable Artifact)	(0.1 to 1) Ω (1 to 500) Ω (0.5 to 5) k Ω (5 to 10) k Ω (10 to 100) k Ω	5.8 m Ω 58 m Ω 1.2 Ω 60 Ω 58 Ω	Comparison to Resistance Decade Box
¹ High Resistance, Insulation Testers, Resistivity Meters @ (50 to 1 000) V	(0.1 to 10) M Ω (10 to 20) M Ω (20 to 30) M Ω (30 to 50) M Ω (50 to 100) M Ω (100 to 200) M Ω (200 to 500) M Ω (0.5 to 1) G Ω 10 G Ω	5.8 k Ω 32 k Ω 69 k Ω 75 k Ω 94 k Ω 2.8 M Ω 4.5 M Ω 7.1 M Ω 72 M Ω	Comparison to Resistance Decade Box
¹ Electrical Simulation of RTD Indicating Devices – Source/Measure	Pt 385, 100 Ω (-200 to 0) $^{\circ}\text{C}$ (0 to 400) $^{\circ}\text{C}$ (400 to 650) $^{\circ}\text{C}$	0.15 $^{\circ}\text{C}$ 0.25 $^{\circ}\text{C}$ 0.48 $^{\circ}\text{C}$	Comparison to Fluke 744 Process Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Electrical Simulation of RTD Indicating Devices – Source/Measure	Pt 385, 100 Ω		Comparison to Fluke 744 Process Calibrator
	(-200 to 0) $^{\circ}\text{C}$	0.09 $^{\circ}\text{C}$	
	(0 to 300) $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
	(300 to 400) $^{\circ}\text{C}$	0.15 $^{\circ}\text{C}$	
	(400 to 630) $^{\circ}\text{C}$	0.18 $^{\circ}\text{C}$	
	(630 to 800) $^{\circ}\text{C}$	0.33 $^{\circ}\text{C}$	
	Pt 385, 200 Ω		
	(-200 to 100) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$	
	(100 to 260) $^{\circ}\text{C}$	0.09 $^{\circ}\text{C}$	
	(260 to 300) $^{\circ}\text{C}$	0.18 $^{\circ}\text{C}$	
	(300 to 400) $^{\circ}\text{C}$	0.19 $^{\circ}\text{C}$	
	(400 to 600) $^{\circ}\text{C}$	0.2 $^{\circ}\text{C}$	
	(600 to 630) $^{\circ}\text{C}$	0.23 $^{\circ}\text{C}$	
	Pt 385, 500 Ω		
	(-200 to -80) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$	
	(-80 to 100) $^{\circ}\text{C}$	0.09 $^{\circ}\text{C}$	
	(100 to 260) $^{\circ}\text{C}$	0.1 $^{\circ}\text{C}$	
	(260 to 400) $^{\circ}\text{C}$	0.13 $^{\circ}\text{C}$	
	(400 to 600) $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
	(600 to 630) $^{\circ}\text{C}$	0.16 $^{\circ}\text{C}$	
	Pt 385, 1 000 Ω		
	(-200 to -80) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$	
	(-80 to 100) $^{\circ}\text{C}$	0.09 $^{\circ}\text{C}$	
	(100 to 260) $^{\circ}\text{C}$	0.1 $^{\circ}\text{C}$	
	(260 to 400) $^{\circ}\text{C}$	0.13 $^{\circ}\text{C}$	
	(400 to 600) $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
	(600 to 630) $^{\circ}\text{C}$	0.16 $^{\circ}\text{C}$	
	Pt 3916, 100 Ω		
	(-200 to -190) $^{\circ}\text{C}$	0.36 $^{\circ}\text{C}$	
	(-190 to -80) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$	
	(-80 to 0) $^{\circ}\text{C}$	0.09 $^{\circ}\text{C}$	
	(0 to 260) $^{\circ}\text{C}$	0.11 $^{\circ}\text{C}$	
	(260 to 300) $^{\circ}\text{C}$	0.13 $^{\circ}\text{C}$	
	(300 to 400) $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
	(400 to 600) $^{\circ}\text{C}$	0.15 $^{\circ}\text{C}$	
	(600 to 630) $^{\circ}\text{C}$	0.33 $^{\circ}\text{C}$	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Electrical Simulation of RTD Indicating Devices – Source	Pt 3926, 100 Ω (-200 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) $^{\circ}\text{C}$ Cu 427, 10 Ω (-100 to 260) $^{\circ}\text{C}$	0.09 $^{\circ}\text{C}$ 0.12 $^{\circ}\text{C}$ 0.14 $^{\circ}\text{C}$ 0.16 $^{\circ}\text{C}$ 0.18 $^{\circ}\text{C}$ 0.42 $^{\circ}\text{C}$	Comparison to Fluke 5500A Multiproduct Calibrator
¹ Electrical Simulation of RTD Indicating Devices – Measure	Pt 385, 100 Ω (-200 to 0) $^{\circ}\text{C}$ (0 to 300) $^{\circ}\text{C}$ (300 to 400) $^{\circ}\text{C}$ (400 to 650) $^{\circ}\text{C}$	0.02 $^{\circ}\text{C}$ 0.022 $^{\circ}\text{C}$ 0.024 $^{\circ}\text{C}$ 0.03 $^{\circ}\text{C}$	Comparison to Agilent 34401A 6.5 Digit Multimeter
¹ Electrical Simulation of Thermocouple Indicating Devices – Source/Measure	Type E (-200 to -100) $^{\circ}\text{C}$ (-100 to 0) $^{\circ}\text{C}$ (0 to 1 000) $^{\circ}\text{C}$ Type J (-200 to 0) $^{\circ}\text{C}$ (0 to 600) $^{\circ}\text{C}$ (600 to 900) $^{\circ}\text{C}$ (900 to 1 200) $^{\circ}\text{C}$ Type K (-200 to 0) $^{\circ}\text{C}$ (0 to 150) $^{\circ}\text{C}$ (150 to 1 100) $^{\circ}\text{C}$ (1 100 to 1 372) $^{\circ}\text{C}$ Type N (-200 to 0) $^{\circ}\text{C}$ (0 to 150) $^{\circ}\text{C}$ (150 to 900) $^{\circ}\text{C}$ (900 to 1 300) $^{\circ}\text{C}$ Type R (0 to 200) $^{\circ}\text{C}$ (200 to 400) $^{\circ}\text{C}$ (400 to 1 760) $^{\circ}\text{C}$	0.47 $^{\circ}\text{C}$ 0.3 $^{\circ}\text{C}$ 0.29 $^{\circ}\text{C}$ 0.44 $^{\circ}\text{C}$ 0.3 $^{\circ}\text{C}$ 0.29 $^{\circ}\text{C}$ 0.3 $^{\circ}\text{C}$ 0.54 $^{\circ}\text{C}$ 0.4 $^{\circ}\text{C}$ 0.4 $^{\circ}\text{C}$ 0.4 $^{\circ}\text{C}$ 0.83 $^{\circ}\text{C}$ 0.62 $^{\circ}\text{C}$ 0.62 $^{\circ}\text{C}$ 0.4 $^{\circ}\text{C}$ 1.6 $^{\circ}\text{C}$ 1.2 $^{\circ}\text{C}$ 1.2 $^{\circ}\text{C}$	Comparison to Fluke 744 Process Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Electrical Simulation of Thermocouple Indicating Devices – Source/Measure	Type S (0 to 200) °C	1.6 °C	Comparison to Fluke 744 Process Calibrator
	(200 to 1 760) °C	1.3 °C	
	Type T (-200 to -100) °C	0.56 °C	
	(-100 to 0) °C	0.52 °C	
	(0 to 400) °C	0.4 °C	
¹ Electrical Simulation of Thermocouple Indicating Devices – Source/Measure	Type E (-250 to -100) °C	0.7 °C	Comparison to Fluke 5500A Multiproduct Calibrator
	(-100 to -25) °C	0.23 °C	
	(-25 to 350) °C	0.2 °C	
	(350 to 650) °C	0.23 °C	
	(650 to 1 000) °C	0.3 °C	
	Type J (-210 to -100) °C	0.38 °C	
	(-100 to -25) °C	0.23 °C	
	(-25 to 150) °C	0.2 °C	
	(150 to 760) °C	0.24 °C	
	(760 to 1 200) °C	0.33 °C	
	Type K (200 to -100) °C	0.46 °C	
	(-100 to -25) °C	0.26 °C	
	(-25 to 120) °C	0.23 °C	
	(120 to 1 000) °C	0.37 °C	
	(1 000 to 1 372) °C	0.56 °C	
	Type N (-250 to -100) °C	0.56 °C	
	(-100 to -25) °C	0.32 °C	
	(-25 to 120) °C	0.28 °C	
	(120 to 410) °C	0.26 °C	
	(410 to 1 300) °C	0.38 °C	
	Type R (0 to 250) °C	0.8 °C	
	(250 to 400) °C	0.5 °C	
	(400 to 1 000) °C	0.47 °C	
	(1 000 to 1 767) °C	0.56 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Electrical Simulation of Thermocouple Indicating Devices – Source/Measure	Type S (0 to 250) °C (250 to 400) °C (400 to 1 000) °C (1 000 to 1 767) °C Type T (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.66 °C 0.51 °C 0.52 °C 0.65 °C 0.88 °C 0.34 °C 0.23 °C 0.21 °C	Comparison to Fluke 5500A Multiproduct Calibrator
¹ Capacitance – Source (Simulation)	50 Hz to 1 kHz (330 to 500) pF (0.5 to 1.09) nF (1.1 to 3.29) nF (3.3 to 10.9) nF (11 to 32.9) nF (33 to 109.9) nF (110 to 329.9) nF (0.33 to 1.09) µF (1.1 to 3.29) µF (50 to 400) Hz (3.3 to 10.9) µF (11 to 32.9) µF (50 to 200) Hz (33 to 109.9) µF (50 to 100) Hz (110 to 329.9) µF (0.33 to 1) mF	0.4 % of reading + 8 pF 0.4 % of reading + 10 pF 0.4 % of reading + 10 pF 0.4 % of reading + 12 pF 0.2 % of reading + 0.1 nF 0.2 % of reading + 0.1 nF 0.2 % of reading + 0.65 nF 0.2 % of reading + 1.3 nF 0.2 % of reading + 6.5 nF 0.2 % of reading + 10 nF 0.32 % of reading + 80 nF 0.37 % of reading + 0.1 µF 0.54 % of reading + 0.65 µF 0.78 % of reading + 0.65 µF	Comparison to Fluke 5500A Multiproduct Calibrator
¹ DC Power – Source (0.33 to 1 000) V	< 330 mA (0.1 089 to < 330) W (0.33 to < 2.2) A (0.33 to < 2.2) kW (2.2 to 10) A (2.2 to 10) kW	0.1 mW/W + 6 mW 0.34 mW/W + 60 mW 0.58 mW/W + 0.6 W	Comparison to Fluke 5500A Multiproduct Calibrator
¹ AC Power – Source (45 to 65) Hz PF = 1 (0.33 to 1 000) V	Up to 329 mA (0.1089 to < 10.9) W (10.9 to < 330) W (0.33 to < 2.2) A (0.33 to < 2.2) kW (2.2 to 10) A (2.2 to < 3.3) kW (3.3 to 10) kW	0.94 mW/W + 1.3 mW 1.6 mW/W + 6 mW 1.1 mW/W + 6 mW 0.85 mW/W + 60 mW 0.78 mW/W + 0.6 W	Comparison to Fluke 5500A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
^{1,2} Power Factor – Source Phase Angle (ϕ) (0 to 10)° (10 to 20)° (20 to 30)° (30 to 40)° (40 to 50)° (50 to 60)° (60 to 70)° (70 to 80)° (80 to 90)° Phase Angle (ϕ) (0 to 10)° (10 to 20)° (20 to 30)° (30 to 40)° (40 to 50)° (50 to 60)° (60 to 70)° (70 to 80)° (80 to 90)° Phase Angle (ϕ) (0 to 10)° (10 to 20)° (20 to 30)° (30 to 40)° (40 to 50)° (50 to 60)° (60 to 70)° (70 to 80)° (80 to 90)°	(60 to 65) Hz Power Factor (Cos ϕ) (0.985 to 1) (0.940 to 0.984) (0.866 to 0.939) (0.766 to 0.865) (0.643 to 0.765) (0.500 to 0.642) (0.342 to 0.499) (0.174 to 0.341) (0 to 0.173) (65 to 400) Hz Power Factor (Cos ϕ) (0.985 to 1) (0.940 to 0.984) (0.866 to 0.939) (0.766 to 0.865) (0.643 to 0.765) (0.500 to 0.642) (0.342 to 0.499) (0.174 to 0.341) (0 to 0.173) 400 Hz to 1 kHz Power Factor (Cos ϕ) (0.985 to 1) (0.940 to 0.984) (0.866 to 0.939) (0.766 to 0.865) (0.643 to 0.765) (0.500 to 0.642) (0.342 to 0.499) (0.174 to 0.341) (0 to 0.173)	0.001 1 0.001 5 0.002 0.001 3 0.002 6 0.002 9 0.003 0.003 2 0.003 3 0.003 0.005 0.007 0.009 0.011 0.012 0.013 0.013 0.014 0.006 0.011 0.015 0.02 0.022 0.025 0.027 0.028 0.03	Comparison to Fluke 5500A Multiproduct Calibrator
¹ DC Voltage – Measure	Up to 10 mV (> 10 to 100) mV (> 0.1 to 1) V (> 1 to 10) V (> 10 to 100) V (>100 to 1 000) V	60 μ V/V + 2 μ V 60 μ V/V + 5 μ V 46 μ V/V + 10 μ V 40 μ V/V + 60 μ V 52 μ V/V + 0.7 mV 52 μ V/V + 12 mV	Comparison to Agilent 34401A 6.5 Digit Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ DC High Voltage – Measure	Up to 1 kV (> 1 to 2) kV (> 2 to 3) kV (> 3 to 4) kV (> 4 to 5) kV (> 5 to 6) kV (> 6 to 7) kV (> 7 to 8) kV (> 8 to 9) kV (> 9 to 10) kV	24 V 47 V 70 V 93 V 0.12 kV 0.14 kV 0.17 kV 0.19 kV 0.21 kV 0.24 kV	Comparison to Digital Multimeter, Fluke 80K-40 High Voltage Probe
¹ AC Voltage – Measure	10 Hz to 20 kHz Up to 10 mV (> 10 to 100) mV (> 0.1 to 1) V (> 1 to 10) V (> 10 to 100) V (> 100 to 750) V (20 to 50) kHz Up to 100 mV (> 0.1 to 1) V (> 1 to 10) V (> 10 to 100) V (> 100 to 750) V	0.7 mV/V + 50 μ V 0.7 mV/V + 50 μ V 0.7 mV/V + 0.4 mV 0.7 mV/V + 3.6 mV 0.7 mV/V + 36 mV 0.7 mV/V + 0.3 V 1.5 mV/V + 60 μ V 1.5 mV/V + 0.5 mV 15 mV/V + 5 mV 1.5 mV/V + 50 mV 1.5 mV/V + 0.36 V	Comparison to Agilent 34401A 6.5 Digit Multimeter
¹ AC High Voltage – Measure	50 Hz Up to 1 kV (> 1 to 2) kV (> 2 to 3) kV (> 3 to 4) kV (> 4 to 5) kV (> 5 to 6) kV (> 6 to 7) kV (> 7 to 8) kV (> 8 to 9) kV (> 9 to 10) kV	58 V 0.12 kV 0.18 kV 0.24 kV 0.29 kV 0.35 kV 0.41 kV 0.47 kV 0.53 kV 0.58 kV	Comparison to Digital Multimeter, Fluke 80K-40 High Voltage Probe
¹ DC Current – Measure	Up to 1 mA (> 1 to 10) mA (> 10 to 100) mA (> 0.1 to 1) A (> 1 to 3) A	0.6 mA/A + 0.25 μ A 0.6 mA/A + 2.5 μ A 0.6 mA/A + 6 μ A 1.2 mA/A + 0.12 mA 1.4 mA/A + 0.7 mA	Comparison to Agilent 34401A 6.5 Digit Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ DC Current – Measure	Up to 30 A (> 30 to 50) A	3.5 mA/A + 5 μ A 2.5 mA/A + 5 μ A	Comparison to Agilent 34330A Current Shunt, Yokogawa Standard Current Shunt, Agilent 34401A 6.5 Digit Multimeter
¹ AC Current – Measure	10 Hz to 5 kHz Up to 0.1 mA (> 0.1 to 1) mA (> 1 to 10) mA (> 10 to 100) mA (> 0.1 to 1) A (> 1 to 3) A	1.2 mA/A + 0.6 μ A 1.2 mA/A + 1.2 μ A 1.2 mA/A + 7 μ A 1.2 mA/A + 70 μ A 1.2 mA/A + 0.7 mA 2.7 mA/A + 2.0 mA	Comparison to Agilent 34401A 6.5 Digit Multimeter
¹ AC Current – Measure	50 Hz to 1 kHz Up to 30 A (1 to 5) kHz Up to 10 A	3.6 mA/A + 50 μ A 58 mA/A + 50 μ A	Comparison to Agilent 34330A Current Shunt, Agilent 34401A 6.5 Digit Multimeter
¹ DC/AC Cutoff Current – Measure	DC (Up to 100) mA AC @ (50, 60) Hz (Up to 50) mA (> 50 to 100) mA	0.025 mA/A + 10 μ A 0.18 mA/A + 75 μ A 0.18 mA/A + 85 μ A	Comparison to Agilent 34401A 6.5 Digit Multimeter
¹ Resistance – Measure	Up to 100 Ω (> 100 to 1 000) Ω (> 1 to 10) k Ω (> 10 to 100) k Ω (> 0.1 to 1) M Ω (> 1 to 2) M Ω (> 2 to 10) M Ω (> 10 to 100) M Ω	0.12 m Ω / Ω + 5 m Ω 0.12 m Ω / Ω + 12 m Ω 0.12 m Ω / Ω + 0.12 Ω 0.12 m Ω / Ω + 1.2 Ω 0.12 m Ω / Ω + 13 Ω 0.12 m Ω / Ω + 0.12 k Ω 0.47 m Ω / Ω + 0.16 k Ω 0.93 m Ω / Ω + 12 k Ω	Comparison to Agilent 34401A 6.5 Digit Multimeter

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Caliper (External/Internal/Depth)	Up to 300 mm (> 300 to 500) mm (> 500 to 600) mm (> 600 to 1 000) mm	18 µm 25 µm 36 µm 42 µm	Comparison to Gauge Block Set (Steel)
¹ Height Gauge Dial and Digital	Up to 200 mm (> 200 to 300) mm (> 300 to 600) mm (> 600 to 1 000) mm	16 µm 18 µm 36 µm 42 µm	Comparison to Gauge Block Set (Steel)
¹ Outside /Inside Micrometer	(0 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 325) mm (> 325 to 375) mm (> 375 to 425) mm (> 425 to 450) mm (> 450 to 475) mm (> 475 to 500) mm	1 µm 1.6 µm 2.3 µm 3 µm 6.8 µm 7.2 µm 7.6 µm 8 µm 8.5 µm 9 µm 9.6 µm 11 µm 12 µm 13 µm 14 µm 15 µm 16 µm	Comparison to Gauge Block Set (Steel)
¹ Dial and Digital Thickness Gauge	Up to 25 mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	1.5 µm 1.9 µm 2.5 µm 3 µm	Comparison to Gauge Block Set
¹ Dial and Digital Depth Gauge	Up to 300 mm (> 300 to 450) mm (> 450 to 600) mm	16 µm 18 µm 21 µm	Gauge Block Set per JIS B 7518.
¹ Holtest/Borematic/ Three-point Internal Micrometer	(10 to 25) mm (> 25 to 50) mm (> 50 to 75) mm (> 75 to 100) mm	2 µm 2.3 µm 3.1 µm 4.2 µm	Comparison to Master Ring Gauge
¹ Caliper Gauge (External/Internal)	Up to 10 mm (> 10 to 20) mm (> 20 to 50) mm (> 50 to 100) mm	3 µm 3.2 µm 6.1 µm 12 µm	Comparison to Gauge Block Set

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Surface Roughness Testers	Ra = 2.94 μ m Rz = 9.3 μ m	0.091 μ m 0.29 μ m	Roughness Specimen per JIS B 0651
¹ Coating Thickness Gauge	50 μ m 100 μ m 250 μ m 500 μ m 1 000 μ m 1 977 μ m 3 044 μ m 3 817 μ m 4 832 μ m 5 631 μ m	0.5 μ m 0.5 μ m 0.8 μ m 0.8 μ m 0.8 μ m 0.8 μ m 1 μ m 1.1 μ m 1.3 μ m 1.5 μ m	Comparison to Master Calibration Foil
¹ Ultrasonic Thickness Gauge	Up to 50 mm (50 to 100) mm (100 to 200) mm (200 to 300) mm	0.006 mm 0.007 mm 0.008 mm 0.01 mm	Comparison to Gauge Block Set
¹ Cylinder Gauge/ Bore Gauge	Up to 1.5 mm	5 μ m	Calibration Tester per JIS-B 7515
¹ Dial Test Indicator	Up to 1.5 mm	5 μ m	Calibration Tester per JIS-B 7533
¹ Dial Gauge & Digital Indicator	Up to 50 mm	7.7 μ m	Calibration Tester per JIS-B 7503
¹ Steel Ruler	(0 to 300) mm (300 to 600) mm (600 to 1 200) mm (1 200 to 1 500) mm (1 500 to 1 800) mm (1 800 to 2 000) mm	0.013 mm 0.016 mm 0.022 mm 0.025 mm 0.029 mm 0.031 mm	Comparison using Calibration Tester JIS B 7516

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Scales and Balances (0.000 01 g Resolution)	1 mg to 10 g (> 10 to 100) g	0.18 mg 0.19 mg	Comparison to Master OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Scales and Balances (0.000 1 g Resolution)	(> 100 to 200) g (> 200 to 300) g	0.31 mg 1 mg	Comparison to Master OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.
¹ Scales and Balances (0.001 g Resolution)	(> 300 to 500) g (> 500 to 1 000) g (> 1 000 to 2 000) g	1.1 mg 1.8 mg 12 mg	Comparison to Master OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.
¹ Scales and Balances (0.01 g Resolution)	(> 2 000 to 5 000) g	18 mg	Comparison to Master OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.
¹ Scales and Balances (0.001 kg Resolution)	(> 5 to 10) kg (> 10 to 20) kg	87 mg 0.12 g	Comparison to Master OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.
¹ Scales and Balances (0.01 kg Resolution)	(> 20 to 30) kg (> 30 to 60) kg (> 60 to 100) kg (> 100 to 150) kg (> 150 to 200) kg	8.2 g 8.3 g 8.5 g 8.9 g 17 g	Comparison to OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.
¹ Scales and Balances (0.02 kg Resolution)	(> 200 to 300) kg	17 g	Comparison to OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Scales and Balances (0.05 kg Resolution)	(> 300 to 600) kg	41 g	Comparison to OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.
¹ Scales and Balances (0.1 kg Resolution)	(> 600 to 1 000) kg (> 1 000 to 2 000) kg	82 g 164 g	Comparison to OIML Class E2, F1, M1 weights and internal calibration procedure utilized in the calibration of the weighing system.
¹ Mass Determination	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	27 µg 30 µg 33 µg 38 µg 43 µg 54 µg 67 µg 84 µg 0.13 mg 0.22 mg 0.4 mg 0.78 mg 2.1 mg 4 mg 11 mg 23 mg 86 mg 0.14 g	Comparison to OIML Class E2, F1, and M1 Weights, Electronic Balance
¹ Anemometers	3.5 m/s 5 m/s 7.5 m/s 10 m/s 12.5 m/s 15 m/s 17.5 m/s 20 m/s	0.1 m/s 0.12 m/s 0.18 m/s 0.25 m/s 0.28 m/s 0.37 m/s 0.43 m/s 0.52 m/s	Comparison to Manometer, Pitot Tube, Airflow/Wind Tunnel
¹ Push-Pull Gauge, Force Gauge, Tension Gauge, Tensile Gauge	(0 to 29.4) N (> 29.4 to 98) N (> 98 to 980) N	0.058 N 0.3 N 0.6 N	Comparison to OIML Class E2, F1, and M1 weights

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Pressure Gauge (Pneumatic) Digital Pressure Gauge, Pressure Transducer, Differential Pressure Gauge, Manometer, Pressure Switch	(0 to 200) kPa (> 200 to 2 000) kPa	0.12 kPa 1.2 kPa	Comparison to Pressure Calibrator
¹ Pressure Gauge (Hydraulic) Digital Pressure Gauge, Pressure Transducer, Differential Pressure Gauge, Manometer, Pressure Switch	(0 to 10) MPa (>10 to 20) MPa (> 20 to 70) MPa	8.5 kPa 15 kPa 53 kPa	Comparison to Pressure Calibrator
¹ Differential Pressure Gauge	(-250 to 0) Pa (0 to 250) Pa	0.88 Pa 0.88 Pa	Comparison to Pressure Calibrator
¹ Vacuum Gauge	(- 90 to 0) kPa	73 Pa	Comparison to Pressure Calibrator
¹ Pressure Transmitter	(- 90 to 0) kPa (> 0 to 200) kPa (> 200 to 2 000) kPa	0.1 kPa 0.2 kPa 2 kPa	Comparison to Pressure Calibrator/Process Calibrator
^{1,3} Flow Meter (Liquid flow)	(0 to 8.334) l/s (> 8.334 to 16.668) l/s (> 16.668 to 30.56) l/s	0.57 % of reading 0.23 % of reading 0.42 % of reading	Comparison to Ultrasonic Flow Meter
¹ Measuring Pipettes, Graduated pipette, Volumetric pipette	(0.5 to 5) mL 10 mL 25 mL 50 mL 100 mL	0.002 ml 0.004 ml 0.0078 ml 0.024 ml 0.077 ml	Comparison to Electronic Balance, OIML Class E2 and F1 weights
¹ Micro Pipette, Auto Pipette, Dispenser	(10 to 100) µL (> 100 to 200) µL (> 200 to 500) µL (> 500 to 1 000) µL (> 1 to 2) mL (> 2 to 5) mL (> 5 to 10) mL	0.1 µL 0.17 µL 0.23 µL 0.26 µL 0.32 µL 0.47 µL 0.62 µL	Comparison to Electronic Balance, OIML Class E2 and F1 weights

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Volumetric Glass Ware and Operated Volumetric Apparatus - Volumetric flask, Cylinder, Beaker	5 mL 10 mL 25 mL 50 mL 100 mL 200 mL 250 mL 500 mL 1 000 mL 2 000 mL	0.006 ml 0.016 ml 0.052 ml 0.12 ml 0.16 ml 0.29 ml 0.29 ml 0.85 ml 1.9 ml 3.7 ml	Comparison to Electronic Balance, OIML Class E2 and F1 weights
¹ Burettes	5 mL 10 mL 25 mL 50 mL 100 mL	0.001 mL 0.002 mL 0.0078 mL 0.012 mL 0.031 mL	Comparison to Electronic Balance, OIML Class E2 and F1 weights
¹ Viscosity Meter (25 to 50) °C	Dynamic Viscosity 28.79 cP 44.98 cP 50.08 cP 99.65 cP 201.6 cP 363.7 cP 419.1 cP 1 028 cP 2 201 cP 4 548 cP 5 396 cP 15 756 cP	0.08 cP 0.11 cP 0.14 cP 0.24 cP 0.51 cP 0.96 cP 1.1 cP 2.5 cP 6.6 cP 15 cP 21 cP 52 cP	Comparison to Viscosity Solution Standard

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Temperature Controlled Chamber, Hot Air Oven, Incubator, Refrigerator, Freezer	(-40 to -10) °C (> -10 to 0) °C (> 0 to 10) °C (> 10 to 70) °C (> 70 to 150) °C (> 150 to 250) °C	0.26 °C 0.26 °C 0.25 °C 0.25 °C 1.1 °C 1.5 °C	Comparison to Agilent 34970A Data Logger

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Autoclave	(105 to 135) °C	0.68 °C	Comparison to Agilent 34970A Data Logger
¹ Liquid Bath, Micro Bath	(-20 to -10) °C (> -10 to 0) °C (> 0 to 100) °C (> 100 to 200) °C	0.25 °C 0.26 °C 0.3 °C 0.3 °C	Comparison to Agilent 34970A Data Logger
¹ Temperature Gauges & Dial Thermometers	(-20 to -10) °C (-10 to 0) °C (> 0 to 200) °C (> 200 to 400) °C	0.34 °C 0.34 °C 0.36 °C 0.62 °C	Comparison to PRT Standard, Digital Readout
¹ Thermocouple Sensors	Types K, J, E, T, N, R, S (-20 to -10) °C (> -10 to 0) °C (> 0 to 200) °C (> 200 to 400) °C	0.36 °C 0.4 °C 0.4 °C 0.43 °C	Comparison to PRT Standard, Digital Readout
¹ Thermocouple Sensors	Types K, J, E, T, N, R, S (> 400 to 550) °C (> 550 to 700) °C (> 700 to 1 200) °C	1.8 °C 2.8 °C 3.1 °C	Comparison to Thermocouple Standard, Digital Readout
¹ Temperature Indicator with Thermocouple Sensor	Types K, J, E, T, N (-40 to -20) °C (-20 to -10) °C (> -10 to 200) °C (> 200 to 400) °C	0.25 °C 0.25 °C 0.25 °C 0.61 °C	Comparison to PRT Standard, Digital Readout
¹ Temperature Indicator with Thermocouple Sensor	Types K, J, E, T, N (> 400 to 550) °C (> 550 to 700) °C (> 700 to 1 200) °C	1.7 °C 2.8 °C 3.1 °C	Comparison to Thermocouple Standard, Digital Readout
¹ Temperature Indicator with Thermocouple Sensor	Types R, S (0 to 200) °C (> 200 to 400) °C	0.2 °C 0.6 °C	Comparison to PRT Standard, Digital Readout
¹ Temperature Indicator with Thermocouple Sensor	Types R, S (> 400 to 550) °C (> 550 to 700) °C (> 700 to 1 200) °C	1.7 °C 2.8 °C 3.1 °C	Comparison to Thermocouple Standard, Digital Readout
¹ Temperature Indicator with RTD Sensor or Thermistor Sensor	(-40 to -20) °C (-20 to -10) °C (> -10 to 200) °C (>100 to 300) °C (>300 to 400) °C	0.17 °C 0.17 °C 0.18 °C 0.2 °C 0.2 °C	Comparison to PRT Standard, Digital Readout

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Temperature Indicator with RTD Sensor or Thermistor Sensor	(> 400 to 550) °C (> 550 to 650) °C	1.7 °C 2.8 °C	Comparison to Thermocouple Standard, Digital Readout
¹ RTD Sensor	(-20 to -10) °C (-10 to 400) °C	0.21 °C 0.21 °C	Comparison to PRT Standard, Digital Readout
¹ RTD Sensor	(> 400 to 550) °C (> 550 to 650) °C	1.7 °C 2.8 °C	Comparison to Thermocouple Standard, Digital Readout
¹ Liquid in Glass Thermometer	(-20 to 200) °C	0.17 °C	Comparison to PRT Standard, Digital Readout
¹ Dry Block, Dry Well	(-20 to 400) °C	0.36 °C	Comparison to PRT Standard, Digital Readout
¹ Dry Block, Dry Well	(> 400 to 550) °C (> 550 to 700) °C (≥ 700 to 1 200) °C	0.8 °C 2.4 °C 2.7 °C	Comparison to Thermocouple Standard, Digital Readout
¹ Thermo-Hygrometer Temperature Humidity	(20 to 50) °C (30 to 90) %RH	0.5 °C 2 %RH	Comparison to Data Logger
¹ Humidity Chamber Mapping Temperature (20 to 40) °C	30 %RH 40 %RH 50 %RH 60 % RH 70 % RH 80 %RH 90 %RH	3.7 %RH 3.7 %RH 3.8 %RH 3.8 %RH 3.8 %RH 3.9 %RH 3.9 %RH	Comparison to Humidity Datalogger, Humidity Probe
¹ Infrared Thermometer	(30 to 50) °C (> 50 to 100) °C (> 100 to 200) °C (> 200 to 300) °C (> 300 to 400) °C (> 400 to 500) °C	0.76 °C 1.3 °C 2.5 °C 3.6 °C 4.8 °C 5.9 °C	Comparison to Blackbody Source, Digital Thermometer (Flat Plate) $\epsilon = 0.95$, $\lambda = (8 \text{ to } 14) \mu\text{m}$

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
¹ Frequency – Source	(0.1 to 500) Hz > 500 Hz to 5 kHz (> 5 to 50) kHz (> 50 to 100) kHz	20 μ Hz/Hz + 5.9 mHz 20 μ Hz/Hz + 58 mHz 20 μ Hz/Hz + 0.58 Hz 20 μ Hz/Hz + 5.8 Hz	Comparison to Fluke 5500A Multiproduct Calibrator
^{1,3} Digital Tachometer (Photo-type)	(2.5 to 999.99) rpm (> 999.99 to 9 999.9) rpm (> 9 999.9 to 99 999) rpm	0.005 8 rpm 0.058 rpm 0.58 rpm	Comparison to Fluke 5500A Multiproduct Calibrator, Light Emitting Diode (LED)
¹ Centrifuge Timer	Up to 30 min	31 ms	Comparison to Digital Stopwatch
^{1,3} Centrifuge Rotational Speed	(10 to 100) rpm (> 100 to 500) rpm (> 500 to 900) rpm (> 900 to 1 000) rpm (> 1 000 to 2 000) rpm (> 2 000 to 3 000) rpm (> 3 000 to 5 000) rpm (> 5 000 to 9 000) rpm (> 9 000 to 10 000) rpm (> 10 000 to 12 000) rpm (> 12 000 to 15 000) rpm	0.21 rpm 0.45 rpm 0.66 rpm 0.72 rpm 1.3 rpm 2 rpm 3.1 rpm 5.4 rpm 7.1 rpm 8.3 rpm 10 rpm	Comparison to Digital Tachometer

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:

- 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.
- There is no unit of measure associated with Power Factor readings.
- rpm = revolutions per minute; l/s = liters per second.
- This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2662.



Jason Stine, Vice President