



CERTIFICATE OF ACCREDITATION

This is to attest that

UL INTERNATIONAL LIMITED

19/F, WATSON CENTRE, 16-22 KUNG YIP STREET
KWAI CHUNG, N.T., HONG KONG

Calibration Laboratory CL-173

has met the requirements of AC204, *IAS Accreditation Criteria for Calibration Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories*. This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date February 27, 2024

Expiration Date January 1, 2025



A handwritten signature in black ink, reading "Raj Nathan".

President

SCOPE OF ACCREDITATION

International Accreditation Service, Inc.

3060 Saturn Street, Suite 100, Brea, California 92821, U.S.A. | www.iasonline.org

UL INTERNATIONAL LIMITED

www.ul.com

Contact Name Simy Li

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Accredited to ISO/IEC 17025:2017

Effective Date February 27, 2024

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY ^{1,2} (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Dimensional			
Calipers	0 mm to 150 mm	0.03 mm	OPUS, Ceramic Gauge Block, Grade '0' As per Standard Operation Procedures-ULID-003109 (DCS:11-LO-S0851)
Micrometers	0 mm to 25 mm	0.002 mm	OPUS Ceramic Gauge Block, Grade '0' As per Standard Operation Procedures-ULID-003109 (DCS:11-LO-S0851)
Thermal			
Temperature – Measure ⁴ (Temperature Chamber)	34 °C	0.8 °C	Yokogawa, GP10-1E1Q As per Standard Operation Procedures-ULID-003108 (DCS:11-LO-S0850)
	40 °C	0.9 °C	
	50 °C	0.9 °C	
	70 °C	1.0 °C	
	100 °C	1.1 °C	
	150 °C	1.4 °C	
	200 °C	1.7 °C	
	250 °C	1.9 °C	
	300 °C	2.2 °C	
	350 °C	2.5 °C	
	34 °C to 100 °C	1.1 °C	
	100 °C to 250 °C	1.9 °C	
	250 °C to 350 °C	2.5 °C	

* If information in this CMC is presented in non-SI units, the conversion factors stated in NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" apply.

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MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY ^{1,2} (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Temperature and Humidity measuring devices - Recorder	Temperature 10 °C 25 °C 40 °C 10 °C to 40 °C Relative Humidity (@ 25 °C) 30 %RH 50 %RH 70 %RH 80 %RH 30 %RH to 80 %RH	0.4 °C 0.4 °C 0.4 °C 0.4 °C 2.5 %RH 2.5 %RH 2.5 %RH 2.5 %RH 2.6 %RH	Rotronic Instrument Corporation, HP32, Temperature & Humidity Recorder by direct comparison method as per Standard Operation Procedures-ULID-003108 (DCS:11-LO-S0850)
Electrical – DC/LF			
DC Voltage – Generate ³	10 mV 50 mV 100 mV 0.5 V 1 V 10 V 15 V 30 V 60 V 100 V 150 V 300 V 600 V 1000 V 10 mV to 99.9999 mV 100 mV to 0.999999 V 1 V to 9.99999 V 10 V to 1000 V	2.0 µV 2.2 µV 2.8 µV 7.0 µV 12 µV 0.12 mV 0.24 mV 0.42 mV 1.1 mV 1.8 mV 2.6 mV 5.0 mV 11 mV 17 mV 0.20 mV/V 98 µV/V 12 µV/V 22 µV/V	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
AC Voltage – Generate ³	(50 Hz) 10 mV 25 mV 30 mV 50 mV 100 mV 0.5 V 1 V 10 V 15 V 30 V 60 V 100 V 150 V 300 V	7.5 µV 9.0 µV 12 µV 14 µV 20 µV 0.11 mV 0.17 mV 1.7 mV 2.3 mV 4.1 mV 11 mV 17 mV 24 mV 48 mV	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)

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MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY ^{1,2} (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Voltage - Generate ³ (continued)	600 V	0.15 V	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
	1000 V	0.26 V	
	(50 Hz)		
	10 mV to 99.999 mV	0.87 mV/V	
	100 mV to 1000 V	0.26 mV/V	
	(60 Hz)		
	10 mV	6.3 µV	
	25 mV	8.2 µV	
	30 mV	9.1 µV	
	50 mV	13 µV	
	100 mV	19 µV	
	0.5 V	0.11 mV	
	1 V	0.17 mV	
	10 V	1.7 mV	
	15 V	2.3 mV	
	30 V	4.1 mV	
	60 V	11 mV	
	100 V	17 mV	
	150 V	24 mV	
	300 V	48 mV	
	600 V	0.15 V	
	1000 V	0.26 V	
	(60 Hz)		
10 mV to 99.999 mV	0.79 mV/V		
100 mV to 1000 V	0.26 mV/V		
3 V			
(20 kHz)	0.49 mV		
(100 kHz)	1.8 mV		
50 V			
(20 kHz)	15 mV		
(100 kHz)	120 mV		
150 V			
(1 kHz)	24 mV		
(10 kHz)	29 mV		
(20 kHz)	34 mV		

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MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY ^{1,2} (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
DC Current - Generate ³	10 µA 50 µA 100 µA 1 mA 5 mA 10 mA 20 mA 100 mA 1 A 2 A 5 A 10 A 15 A 20 A 10 µA to 99.999 µA 100 µA to 9.9999 A 10 A to 20 A	17 nA 22 nA 27 nA 0.12 µA 0.60 µA 1.0 µA 1.8 µA 9.8 µA 0.22 mA 0.66 mA 2.4 mA 4.4 mA 13 mA 16 mA 1.7 mA/A 0.48 mA/A 0.81 mA/A	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
AC Current - Generate ³	(50 Hz) 100 µA 0.5 mA 1 mA 5 mA 10 mA 20 mA 100 mA 1 A 5 A 10 A 15 A 20 A (50 Hz) 100 µA to 0.99999 mA 1 mA to 20 A (60 Hz) 100 µA 0.5 mA 1 mA 5 mA 10 mA 20 mA 100 mA 1 A 5 A 10 A 15 A	0.23 µA 0.50 µA 0.88 µA 3.1 µA 4.7 µA 7.7 µA 46 µA 0.46 mA 3.9 mA 6.2 mA 18 mA 23 mA 3.0 mA/A 1.2 mA/A 0.23 µA 0.50 µA 0.88 µA 3.1 µA 4.6 µA 7.7 µA 46 µA 0.46 mA 3.9 mA 6.2 mA 18 mA	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)

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MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY ^{1,2} (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Current - Generate ³ (continued)	20 A	23 mA	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
	(60 Hz)		
	100 µA to 0.99999 mA	3.0 mA/A 1.2 mA/A	
	1 mA to 20 A		
	1 mA (100 Hz)	1.2 µA	
	(400 Hz)	1.1 µA	
(1 kHz)		1.1 µA	
10 mA (100 Hz)		4.6 µA	
	(400 Hz)	4.6 µA	
(1 kHz)		4.6 µA	
1 A (100 Hz)		0.46 mA	
	(400 Hz)	0.46 mA	
(1 kHz)		0.46 mA	
10 A (100 Hz)		6.2 mA	
	(400 Hz)	9.2 mA	
(1 kHz)		9.2 mA	
DC Resistance - Generate ³	1 Ω	1.6 mΩ	Fluke, 5522A, 2-wire method As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
	10 Ω	1.5 mΩ	
	100 Ω	4.1 mΩ	
	1 kΩ	26 mΩ	
	10 kΩ	0.26 Ω	
	100 kΩ	2.7 Ω	
	1 MΩ	33 Ω	
	10 MΩ	1.4 kΩ	
	100 MΩ	48 kΩ	
	1000 MΩ	14 MΩ	
	1 Ω to 9.9999 Ω	1.7 mΩ/Ω	
	10 Ω to 99.9999 Ω	0.16 mΩ/Ω	
	100 Ω to 0.999999 kΩ	42 µΩ/Ω	
	1k Ω to 1 MΩ	33 µΩ/Ω	
>1 MΩ to 10 MΩ	0.14 mΩ/Ω		
>10 MΩ to 100 MΩ	0.48 mΩ/Ω		
>100 MΩ to 1000 MΩ	14 mΩ/Ω		

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DC Resistance - Generate ³ (continued)	1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 Ω to 9.9999 Ω 10 Ω to 99.9999 Ω 100 Ω to 0.999999 kΩ 1 kΩ to 100 kΩ	1.2 mΩ 1.3 mΩ 4.0 mΩ 26 mΩ 0.26 Ω 2.7 Ω 1.3 mΩ/Ω 0.13 mΩ/Ω 55 μΩ/Ω 27 μΩ/Ω	Fluke, 5522A, 4-wire method As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
Capacitance - Generate ^{3,5}	1 nF 10 nF 100 nF 1 μF 10 μF 100 μF 1000 μF 100 nF to 9.9999 μF 10 μF to 1000 μF	0.025 nF 0.056 nF 0.28 nF 2.8 nF 30 nF 0.44 μF 4.4 μF 3.0 mF/F 4.4 mF/F	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
Frequency - Generate ³	10 Hz 47 Hz 50 Hz 60 Hz 100 Hz 400 Hz 1 kHz 10 kHz 50 kHz 100 kHz 10 Hz to 99.99 Hz 100 Hz to 100 kHz	5.7 mHz 5.7 mHz 5.7 mHz 5.7 mHz 5.7 mHz 57 mHz 57 mHz 0.57 Hz 5.7 Hz 5.7 Hz 0.57 mHz/Hz 0.15 mHz/Hz	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
DC Power - Generate ³	1 mW 10 mW 75 mW 100 mW 1 W 10 W 100 W 1000 W 2000 W 5000 W 10000 W 12000 W 10 mW to 12000 W	1.4 μW 7.5 μW 19 μW 59 μW 0.61 mW 6.0 mW 64 mW 0.74 W 1.8 W 2.3 W 8.1 W 10 W 0.87 mW/W	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)

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AC Power - Generate ³	(50 Hz) 1 mW 10 mW 75 mW 100 mW 1 W 10 W 100 W 1000 W 2000 W 5000 W 10000 W 12000 W 10 mW to 12000 W	1.4 µW 11 µW 49 µW 77 µW 0.76 mW 7.7 mW 51 mW 0.87 W 2.4 W 3.5 W 12 W 14 W 1.2 mW/W	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
	(60 Hz) 1 mW 10 mW 75 mW 100 mW 1 W 10 W 100 W 1000 W 2000 W 5000 W 10000 W 12000 W 10 mW to 12000 W	1.4 µW 11 µW 49 µW 76 µW 0.76 mW 7.6 mW 51 mW 0.86 W 2.4 W 3.5 W 12 W 14 W 1.2 mW/W	
Power Factor Meter	(150 V, 1 A, 50 Hz) 0.1 0.2 0.4 0.6 0.8 1 0.1 to 1	0.0015 0.0015 0.0014 0.0013 0.0011 0.00057 0.0015	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
	(150 V, 1 A, 60 Hz) 0.1 0.2 0.4 0.6 0.8 1 0.1 to 1	0.0015 0.0015 0.0014 0.0013 0.0011 0.00057 0.0015	

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Temperature Data logger (Without Thermocouple) J-Type - Generate ³	-100 °C	0.2 °C	Fluke, 5522A As per Standard Operation Procedures-ULID-003110 (DCS:11-LO-S0853)
	-70 °C	0.2 °C	
	-40 °C	0.2 °C	
	0 °C	0.2 °C	
	23 °C	0.2 °C	
	50 °C	0.2 °C	
	100 °C	0.2 °C	
	200 °C	0.2 °C	
	250 °C	0.2 °C	
	300 °C	0.2 °C	
	500 °C	0.2 °C	
	750 °C	0.2 °C	
	-100 °C to 750 °C	0.2 °C	
	K -Type - Generate ³	-100 °C	
-40 °C		0.2 °C	
0 °C		0.2 °C	
23 °C		0.2 °C	
50 °C		0.2 °C	
100 °C		0.2 °C	
200 °C		0.3 °C	
250 °C		0.3 °C	
300 °C		0.3 °C	
500 °C		0.3 °C	
750 °C		0.3 °C	
850 °C	0.3 °C		
-100 °C to 850 °C	0.3 °C		
T-Type - Generate ³	-100 °C	0.3 °C	
	-40 °C	0.3 °C	
	0 °C	0.2 °C	
	23 °C	0.2 °C	
	50 °C	0.2 °C	
	100 °C	0.2 °C	
	200 °C	0.2 °C	
	250 °C	0.2 °C	
	300 °C	0.2 °C	
	400 °C	0.2 °C	
	-100 °C to 400 °C	0.3 °C	

¹The uncertainty covered by the Calibration and Measurement Capability (CMC) is expressed as the expanded uncertainty having a coverage probability of approximately 95 %. It is the smallest measurement uncertainty that a laboratory can achieve within its scope of accreditation when performing calibrations of a best existing device. The

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measurement uncertainty reported on a calibration certificate may be greater than that provided in the CMC due to the behavior of the calibration item and other factors that may contribute to the uncertainty of a specific calibration.

²When uncertainty is stated in relative terms (such as percent, a multiplier expressed as a decimal fraction or in scientific notation), it is in relation to instrument reading or instrument output, as appropriate, unless otherwise indicated.

³Capability is suitable for the calibration of measuring devices in the stated ranges.

⁴Capability is suitable for the calibration of devices intended to generate the indicated quantity in the stated ranges.

⁵The actual frequency applied by the calibrator cannot be selected and may be dependent on the measurement device under calibration. Approximate frequency ranges for a given capacitance or capacitance range may be found in the Fluke 5522A's published specifications.