CERTIFICATE OF ACCREDITATION

This is to attest that

UNDERWRITERS LABORATORIES TAIWAN CO., LTD.

NO. 260, DAYE ROAD, BEITOU DISTRICT
TAIPEI CITY 112, TAIWAN

Calibration Laboratory CL-294

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 October 28, 2024

Expiration Date November 1, 2025

President

Visit www.iasonline.org for current accreditation information.

SCOPE OF ACCREDITATION

International Accreditation Service, Inc.

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UNDERWRITERS LABORATORIES TAIWAN CO., LTD.

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Accredited to ISO/IEC 17025:2017 *Effective Date October 28, 2024*

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Dimensional			
Digimatic Caliper	up to 200 mm	0.03 mm	Ceramic Block Gauges (Grade 0) / OPUS/0.25 mm to 100 mm As per Standard Operation Procedure-ULID-005057
Digimatic Outside Micrometer	up to 25 mm	0.002 mm	Ceramic Block Gauges (Grade 0) / OPUS/0.25 mm to 100 mm As per Standard Operation Procedure-ULID-005057
Tape	10 mm to 5000 mm	0.25 mm	Scale & Tape Measuring Machine / ADITYA / Line Measure 1000 As per Standard Operation Procedure-ULID-005057
Mechanical			
Electronic Balance[5] (Site)	1 mg to 500 mg >500 mg to 50 g >50 g to 200 g >200 g to 2 kg >2 kg to 10 kg >10 kg to 30 kg >30 kg to 150 kg	0.41 mg 1.7 mg 5.0 mg 0.07 g 1.2 g 3.9 g 0.04 kg	Standard Weights(F2) / Hafner/1 mg to 200 g Standard Weights (F1) / Honder/500 g to 10 kg Gravity Weights (M2) / UL/20 kg As per Standard Operation Procedure-ULID-005065

** 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.*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Mass	50 g to 5 kg >5 kg to 30 kg	2.0 g 4.5 g	Scale / T-Scale/AHW-30+ As per Standard Operation Procedure-ULID-005065
Force Gauge	1.96 N (200 gf) to 19.6 N (2 kgf) >19.6 N (>2 kgf) to 98.1 N (10 kgf) >98.1 N (>10 kgf) to 441 N (45 kgf)	0.059 N (6 gf) 0.29 N (0.03 kgf) 0.98 N (0.10 kgf)	Standard Weights(F2) /Hafner/ 200 g Standard Weights (F1) /Honder/ 500 g Gravity Weights /UL/ 1 kg to 10 kg As per Standard Operation Procedure-ULID-005065
Pressure Meter	20 kPa to 690 kPa	0.81 kPa	Pressure Calibrator / Fluke/718-100G As per Standard Operation Procedure-ULID-005063
Thermal			
Thermocouple: J Type, K Type, T Type	Up to 400 °C (J Type) Up to 400 °C (K Type) Up to 400 °C (T Type)	0.68 °C 0.69 °C 0.68 °C	Platinum Resistance Thermometer /Fluke-5609 + 1521 with Multimeter /Keysight - 34410A As per Standard Operation Procedure-ULID-005056
Temperature Indicator[5] (Lab & Site)	-100 °C to 1200 °C (J Type) -100 °C to 1000 °C (K Type) -150 °C to 400 °C (T Type)	0.5 °C 0.5 °C 0.8 °C	Temperature Calibrator - Fluke-714B As per Standard Operation Procedure-ULID-005059
Temperature Controlled Chamber[5] (Site)	30 °C to 200 °C >200 °C to 350 °C	1.8 °C 2.2 °C	Hybrid Recorder / Yokogawa / MV220, MV2020, MV2030, GP20 with thermocouple K Type Pelican/P82K30-2-512, with thermocouple T Type ROSH/TT-T-30-SLE As per Standard Operation Procedure-ULID-005056

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Sensor/Indicator for Temperature Controlled Chamber[5] (Site)	30 °C to 200 °C >200 °C to 350 °C	1.8 °C 2.4 °C	Hybrid Recorder / Yokogawa/MV220, MV2020, GP20 with thermocouple K Type Pelican/P82K30-2-512 As per Standard Operation Procedure-ULID-005056
Temperature and Humidity Recorder	10 °C to 40 °C 20 %RH to 85 %RH	0.7 °C 2.6 %RH	Hygrometer / Rotronic/HP32 As per Standard Operation Procedure-ULID-005056
Temperature and Humidity Controlled Chamber[5] (Site)	-40 °C to 100 °C 30 °C to 70 °C (10 %RH to 95 %RH) 10 %RH to 95 %RH (30 °C to 70 °C)	1.0 °C 1.0 °C 3.0 %RH	Hygrometer /Rotronic/HP22-A with Hybrid Recorder / Yokogawa/MV220, MV2020, MV2030, GP20 with thermocouple T Type ROSH/TT-T-30-SLE As per Standard Operation Procedure-ULID-005056
Electrical – DC/LF			
DC Voltage Meter[3,5] (Lab & Site)	1 mV to <100 mV 100 mV to <1 V 1 V to 1000 V	2.5 mV/V 71 µV/V 46 µV/V	Multi-Product Calibrator / Fluke/5502A As per Standard Operation Procedure-ULID-005059
DC Voltage Source[4,5] (Lab & Site)	1 mV to <100 mV 100 mV to <1 V 1 V to 1000 V	4.9 mV/V 0.13 mV/V 0.14 mV/V	Multimeter / Keysight/34465A As per Standard Operation Procedure-ULID-005059
DC Current Meter[3,5] (Lab & Site) DC Current Source[4] (Lab & Site)	10 A to 60 A	9.4 mA/A	Multimeter / Keysight/34465A with Shunt / T&M Research/2M-4 As per Standard Operation Procedure-ULID-005059
DC Current Meter[3,5] (Lab & Site)	10 µA to 100 µA >100 µA to 1 mA > 1 mA to 100 mA >100 mA to 1 A >1 A to 10 A >10 A to 20 A	1.7 mA/A 0.28 mA/A 0.15 mA/A 0.33 mA/A 0.84 mA/A 1.1 mA/A	Multi-Product Calibrator / Fluke/5502A As per Standard Operation Procedure-ULID-005059

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
DC Current Source[4,5] (Lab & Site)	10 µA to <100 µA 100 µA to 1 A >1 A to 3 A >3 A to 10 A	1.8 mA/A 2.2 mA/A 3.0 mA/A 2.4 mA/A	Multimeter / Keysight/34465A As per Standard Operation Procedure-ULID-005059
DC High Voltage Source[4,5] (Lab & Site)	1 kV to 9 kV >9 kV to 10 kV	5.9 mV/V 0.79 mV/V	Precision High Voltage Meter / Vitrek/4700 with Precision High Voltage Module / Vitrek/HVL-70 As per Standard Operation Procedure-ULID-005059
AC Voltage Meter[3,5] (Lab & Site)	10 mV to <1 V 1 V to 1000 V (50 Hz, 60 Hz)	3.0 mV/V 0.46 mV/V	Multi-Product Calibrator / Fluke/5502A As per Standard Operation Procedure-ULID-005059
AC Voltage Source[4,5] (Lab & Site)	100 mV to <1 V 1 V to 750 V (50 Hz, 60 Hz)	3.2 mV/V 1.1 mV/V	Multimeter / Keysight/34465A As per Standard Operation Procedure-ULID-005059
AC Current Meter[3,5] (Lab & Site) AC Current Source[4,5] (Lab & Site)	10 A to 50 A (60 Hz) 20 A to 50 A (50 Hz)	8.2 mA/A 22 mA/A	For Current 10 A to 50 A @ 60 Hz: Multimeter / Keysight/34465A with Shunt / T&M Research/2M-4 For Current 20 A to 50 A @ 50 Hz: Clamp-On Probe / Yokogawa/751552 with Multimeter / Keysight/34410A As per Standard Operation Procedure-ULID-005059
AC Current Meter[3,5] (Lab & Site)	100 µA to <1 mA 1 mA to <10 mA 10 mA to 10 A >10 A to 20 A (50 Hz, 60 Hz)	1.9 mA/A 0.93 mA/A 0.72 mA/A 1.2 mA/A	Multi-Product Calibrator / Fluke/5502A As per Standard Operation Procedure-ULID-005059
AC Current Source[4,5] (Lab & Site)	100 µA to 1 mA >1 mA to 100 mA >100 mA to 3 A 3 A to 10 A 3 A to 20 A (50 Hz, 60 Hz)	3.1 mA/A 3.2 mA/A 3.9 mA/A 3.6 mA/A 2.5 mA/A	For Current 100 µA to 10 A: Multimeter / Keysight/34465A For Current 3 A to 20 A: Power Analyzer / Tektronix/PA1000 As per Standard Operation Procedure-ULID-005059

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC High Voltage Source[4,5] (Lab & Site)	0.75 kV to 9 kV >9 kV to 20 kV (60 Hz)	13 mV/V 3.9 mV/V	Precision High Voltage Meter / Vitrek/4700 with Precision High Voltage Module / Vitrek/HVL-70 As per Standard Operation Procedure-ULID-005059
AC Large Current Source[4,5] (Lab & Site)	20 A to <100 A 100 A to 1000 A (50 Hz) 20 A to <100 A 100 A to 1000 A (60 Hz)	22 mA/A 16 mA/A 7.2 mA/A 5.6 mA/A	Clamp-On Probe / Yokogawa/751552 with Multimeter / Keysight/34410A As per Standard Operation Procedure-ULID-005059
AC Large Current Clamp Meter[3]	20 A to 1000 A (50 Hz) 20 A to <100 A 100 A to 1000 A (60 Hz)	36 mA/A 8.8 mA/A 6.7 mA/A	50 Turns Current Coil / Fluke/5500A with Multi-Product Calibrator / Fluke/5502A As per Standard Operation Procedure-ULID-005059
Power Factor Source[4,5] (Lab & Site)	0.2 to 1.0 (Lead/Lag, 50 Hz, 60 Hz)	0.008	Power Analyzer / Tektronix/PA1000 As per Standard Operation Procedure-ULID-005059
Power Factor Meter[3,5] (Lab & Site)	0.2 to 1.0 (Lead/Lag, 50 Hz, 60 Hz)	0.009	Multi-Product Calibrator / Fluke/5502A As per Standard Operation Procedure-ULID-005059
AC Wattage Meter[3,5] (Lab & Site)	1 mW to 10 kW (PF=1.0, 50 Hz, 60 Hz)	3 mW/W	Multi-Product Calibrator / Fluke/5502A As per Standard Operation Procedure-ULID-005059
AC Watt-hourMeter[3]	5 W·h to 2400 W·h (PF=1.0, 50 Hz, 60 Hz)	1.4 %	Power Analyzer / Tektronix/PA1000 with Timer / Fotek/SY-4D As per Standard Operation Procedure-ULID-005059
DC Wattage Meter[3,5] (Lab & Site)	1 mW to 10 kW	3 mW/W	Multi-Product Calibrator / Fluke/5502A As per Standard Operation Procedure-ULID-005059

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
DC Watt-hour Meter[3]	0.5 W·h to 240 W·h	1.1 %	Power Analyzer / Tektronix/PA1000 with Timer / Fotek/SY-4D As per Standard Operation Procedure-ULID-005059
Resistance Meter[3,5] (Lab & Site)	1 Ω to <100 Ω 100 Ω to <10 kΩ 10 kΩ to 1 MΩ >1 MΩ to 100 MΩ 1 mΩ 10 mΩ 100 mΩ 1 MΩ 10 MΩ 100 MΩ 1000 MΩ 10 GΩ 20 GΩ 30 GΩ	7.8 mΩ/Ω 0.19 mΩ/Ω 0.13 mΩ/Ω 4.2 mΩ/Ω 2 mΩ/Ω 0.4 mΩ/Ω 0.29 mΩ/Ω 0.3 % 1.3 % 2 % 1.3 % 1.6 % 2 % 3 %	Multi-Product Calibrator / Fluke/5502A High Capacity Resistor / Burster/1282 Series High Resistance Decade Substituter / IET/HRRS-F-5-1M As per Standard Operation Procedure-ULID-005059
Resistor[4]	1 Ω to <10 Ω 10 Ω to <100 Ω 100 Ω to 100 kΩ >100 kΩ to 1 MΩ >1 MΩ to 10 MΩ >10 MΩ to 100 MΩ	9.5 mΩ/Ω 7.9 mΩ/Ω 0.31 mΩ/Ω 4.2 mΩ/Ω 4.3 mΩ/Ω 10 mΩ/Ω	Multimeter /Keysight/34410A Multimeter /Keysight/34465A As per Standard Operation Procedure-ULID-005059
Capacitance Meter[3] Capacitor[4]	100 pF to <1 nF 1 nF to 1 µF (1 kHz) 100 pF to <1 nF 1 nF to 1 µF (1 kHz)	16 mF/F 12 mF/F 20 mF/F 17 mF/F	Capacitance Box / Time Electronic/1071 LCR Meter / Keysight/U1733C As per Standard Operation Procedure-ULID-005059
AC Withstand Voltage Tester[4]	0.75 kV to 9 kV >9 kV to 20 kV 100 µA to <1 mA 1 mA to 200 mA 3 s to 60 s >60 s to 999 s (60 Hz)	13 mV/V 3.9 mV/V 7 mA/A 5 mA/A 0.2 s 1 s	Precision High Voltage Meter / Vitrek/4700 With Precision High Voltage Module / Vitrek/HVL-70 Multimeter / Keysight/34465A Stopwatch / Casio/HS-3

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
			As per Standard Operation Procedure-ULID-005059 & Standard Operation Procedure-ULID-005062
DC Withstand Voltage Tester[4]	1 kV to 9 kV 9 kV to 10 kV 100 µA to 10 mA 3 s to 60 s >60 s to 999 s	5.9 mV/V 0.79 mV/V 6 mA/A 0.2 s 1 s	Precision High Voltage Meter / Vitrek/4700 With Precision High Voltage Module / Vitrek/HVL-70 Multimeter /Keysight/34465A Stopwatch / Casio/HS-3 As per Standard Operation Procedure-ULID-005059 & Standard Operation Procedure-ULID-005062
Oscilloscope[3] (Accredited only for 2 parameters of peak to peak and time)	100 mV pp to 90 Vpp 100 ns to < 100 ms 100 ms to 1 s	2.5 mV/V 1 ms/s 2 ms/s	Multi-Product Calibrator, Fluke -5502A As per Standard Operation Procedure-ULID-005059
Time and Frequency			
Clock Digital Clock Stop Watch	Time base (measurement @32768 Hz) Time base (measurement @32768 Hz) Time base (measurement @32768 Hz)	9.3 part per 10^6 6.6 part per 10^6 8.9 part per 10^6	Quartz Watch Analyzer / Tai Tien/QWA-5A As per Standard Operation Procedure-ULID-005062
Timer	3 s >3 s to 60 s >60 s to 3600 s	0.1 s 0.2 s 1 s	Stopwatch / Casio/HS-3 As per Standard Operation Procedure-ULID-005062
Frequency Meter[3] Frequency Source[4,5] (Lab & Site)	1 Hz to <100 Hz 100 Hz to 1 MHz 45 Hz to 100 kHz	0.82 mHz/Hz 24 µHz/Hz 0.94 mHz/Hz	Function Generator / Keysight/33210A As per Standard Operation Procedure-ULID-005062 Multimeter / Keysight/34410A Multimeter / Keysight/34465A As per Standard Operation Procedure-ULID-005062
Tachometer (Non-contact Type)	40 rpm to 6000 rpm >6000 rpm to 35000 rpm	3 rpm 5 rpm	Stroboscope / Shimpo/DT311N

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
			As per Standard Operation Procedure-ULID-005062

[1]The 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 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.

[2]When 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.

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

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

[5]Also available as site calibration. Note that actual measurement uncertainties achievable at a customer's site can normally be expected to be larger than the uncertainties listed on this Scope of Accreditation.