เอกสารแนบที่ 4

เอกสารการสอบเทียบเครื่องมือ

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
ระดับเสียงในบรรยากาศ		
ระดับเสียงเฉลี่ย 1 ชั่วโมง (L_{eq} 1 hr) ระดับเสียงเฉลี่ย 24 ชั่วโมง (L_{eq} 24 hr) ระดับเสียงสูงสุด (L_{max}) ระดับเสียงเฉลี่ยกลางวัน-กลางคืน (L_{dn}) ระดับเสียงเปอร์เซ็นไทล์ที่ 90 (L_{90})	Sound Level Calibrator Sound Level Meter No. ST-C1-B10, ST-C1-B13, ST-C1-B19	-
คุณภาพน้ำ		
ความเป็นกรดและด่าง	-	pH Meter
ความนำไฟฟ้า	-	Conductivity Meter
อุณหภูมิ	-	Thermometer
ความขุ่น	-	Turbidity Meter
สารที่ละลายได้ทั้งหมด	-	Digital Balance
สารแขวนลอย	-	Digital Balance
ปริมาณสารทั้งหมด	-	Digital Balance
ซีโอดี	-	COD Reactor
บีโอดี	-	BOD Analyzer
น้ำมันและไขมัน	-	Digital Balance
ฟอสเฟต	-	Spectrophotometer
ฟลูออไรด์	-	Spectrophotometer
ไนเตรท	-	Spectrophotometer
ไนเตรท-ไนโตรเจน	-	Spectrophotometer
ไซยาไนด์คิดเทียบเป็นไฮโดรเจนไซยาไนด์	-	Spectrophotometer
ซัลเฟต	-	Spectrophotometer
แคลเซียม	-	ICP
แมกนีเซียม	-	ICP
แบคทีเรียกลุ่มโคลิฟอร์มทั้งหมด	-	Incubator
แบคทีเรียกลุ่มฟีคอลโคลิฟอร์ม	-	Incubator
ปรอท	-	AAS
แคดเมียม	-	AAS
ตะกั่ว	-	AAS/ICP
สังกะสี	-	AAS/ICP
ทองแดง	-	AAS/ICP
นิกเกิล	-	ICP
แบเรียม	-	ICP
เหล็ก	-	ICP
อาร์เซนิค	-	AAS
เซเลเนียม	-	AAS
แมงกานีส	-	ICP
โครเมียมชนิดเฮ็กซาวาเล้นท์	-	Spectrophotometer
เชื้อลีจิโอเนลลา	-	Incubator

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
ระดับความร้อนในสถานประกอบการ		
WBGT	Digital Thermometer Heat Stress WBGT Meter NO. B05, B12, B17, B21, B22, B26	-
ระดับเสียงในสถานประกอบการ		
ระดับเสียงเฉลี่ย 8 ชั่วโมง (L_{eq} 8 hr) ระดับเสียงสูงสุด (L_{max})	Acoustic Calibrator Sound Level Meter No. ACO-B04, B05, B37, B44, B45, B46 Sound Level Meter No. ACO-C1-B02, B04, B05 Sound Level Meter No. ST-C1-B06, B07, B08, B09, B10, B11, B12, B13, B14, B15, B19, B30	-
ปริมาณเสียงสะสมแบบติดตัวบุคคล		
Noise Dose	Noise Dose Meter No. NMD-B07, B08, B09, B10, B11, B12, B13, B14, B15	-
ระดับความเข้มของแสงสว่างในสถานประกอบการ		
Light Intensity	Light Meter No. B07, B08	-
คุณภาพอากาศในสถานประกอบการ		
Sulfuric Acid	Personal Pump SKC No. B33, B77, B90, B92, R44, R45 Rotameter No. L-B06	IC
Sodium Hydroxide	Personal Pump SKC No. B54, B93, R45 Rotameter No. H-B06	-
Hydrogen Chloride	Personal Pump SKC No. B77, B92, B93 Rotameter No. L-B06	IC
Ammonia	Personal Pump SKC No. B33, B77, B93, R45 Rotameter No. L-B06	IC
Chlorine	Personal Pump SKC No. B92, B93 Rotameter No. H-B06	Colorimetric

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204 **MTC No.** EEL. BP. 152/0169

CALIBRATION CERTIFICATE

Submitted by : S.P.S.CONSULTING SERVICE CO.,LTD.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

Temperature : (23 + 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office
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Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204 **MTC No.** EEL. BP. 152/0169

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20μPa at 1000 Hz

Acoustic Output in dB re 20μPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.89	-0.11	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	± 1.5	±1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.90	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by : ……

(Mr.Weerachai Deechaiyae)

Approved by : ……

(Mr.Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 20112690129004970O1

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office
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Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Noise B_257/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data			
Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	11 February 2026
		Due Date	11 February 2027

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ST-C1-B10	SCARLET	ST-12D	10351483	13 May 2025	93.7	93.9
ST-C1-B13	SCARLET	ST-12D	10351486	13 May 2025	93.9	93.9
ST-C1-B19	SCARLET	ST-12D	10352320	13 May 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

Calibrated by : Adul Dangklom
(Mr. Adul Dangklom)

Approved by :
(Mr. Peera Detudom)

QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

NSC-TISI-TIS17025
CALIBRATION 0049

CERTIFICATE No : 26E3363
REFERENCE No : 80514-1

Certificate of Calibration

EQUIPMENT	:	pH METER
MANUFACTURER	:	HANNA
MODEL	:	HI3512
SERIAL No	:	TH118035
ID No	:	PH 04/56
CONDITION AS RECEIVED	:	USED ITEM
SUBMITTED BY	:	S.P.S. CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD., JOMPOL, CHATUCHAK, BANGKOK 10900
CALIBRATED BY	:	ATSAWIN Y.
CALIBRATION DATE	:	02-Apr-26
APPROVED BY	:	PONGSAK L.
ISSUED DATE	:	02-Apr-26
RECEIVED DATE	:	01-Apr-26

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.

QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

Calibration Report

EQUIPMENT	:	pH METER			
MANUFACTURER	:	HANNA	**MODEL**	:	HI3512
ID No	:	PH 04/56	**SERIAL NUMBER**	:	TH118035
RECEIVED DATE	:	01-Apr-26	**CALIBRATION DATE**	:	02-Apr-26
AMBIENT TEMPERATURE	:	23 ° C ± 3 ° C	**RELATIVE HUMIDITY**	:	50 % RH ± 10% RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD BASED ON WI-TQ-062 AND WI-TQ-063. THE DISPLAY UNIT WAS TESTED BY GENERATING STANDARD VOLTAGE TO THE UNIT AND READING THE VALUE COMPARED WITH THE CALCULATED VALUE. THE DISPLAY AND ELECTROD WAS CALIBRATED BY USING STANDARD pH BUFFER
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No/ LOT No	CERTIFICATE No	DUE DATE
1) pH STANDARD SOLUTION	00651-36	CC829914	4956-16178366	11-Sep-27
2) pH STANDARD SOLUTION	00651-38	CC831093	4957-16224157	01-Oct-27
3) pH STANDARD SOLUTION	00651-40	CC826321	4958-16046326	10-Jul-27
4) PROCESS CALIBRATOR	CA150	91S6079	26E936	17-Mar-27
5) BATH	260014	1247 48074	25T9431	12-Sep-26
6) THERMOMETER WITH PROBE	421504	55000379	25T9466	12-Sep-26

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-
   - NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
   - NATIONAL INSTUTITE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT

1. DISPLAY UNIT ONLY

SLOPE FACTOR k = 2.303 RT/F = 59 mV/pH

mV APPLIED	UUC READING (mV)	CORRECTION (mV)	UUC READING (pH)	UNCERTAINTY OF MEASUREMENT (± mV)	COVERAGE FACTOR k
414.11	414.3	-0.19	-0.256	0.15	2.00
354.95	355.1	-0.15	0.759	0.15	2.00
295.80	296.0	-0.20	1.773	0.15	2.00
236.64	236.8	-0.16	2.787	0.15	2.00
177.48	177.7	-0.22	3.801	0.15	2.00
118.32	118.5	-0.18	4.816	0.15	2.00
59.16	59.4	-0.24	5.831	0.15	2.00
0.00	0.2	-0.20	6.845	0.15	2.00
-59.16	-58.9	-0.26	7.878	0.15	2.00
-118.32	-118.1	-0.22	8.915	0.15	2.00
-177.48	-177.2	-0.28	9.952	0.15	2.00
-236.64	-236.4	-0.24	10.990	0.15	2.00
-295.80	-295.5	-0.30	12.027	0.15	2.00
-354.95	-354.7	-0.25	13.064	0.15	2.00
-414.11	-413.8	-0.31	14.101	0.15	2.00

END OF CALIBRATION REPORT PAGE 2 OF 3

QUALITY CALIBRATION CO., LTD.
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Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 26E3363

Calibration Report

RESULT OF CALIBRATION (CONTINUE) :

2. DISPLAY UNIT WITH pH ELECTRODE S/N: 11340D0M

STANDARD pH BUFFER SOLUTION (pH)	UUC READING (pH)	CORRECTION (pH)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (± pH)	COVERAGE FACTOR k
4.008	4.008	0.000	4.142	0.012	2.00
6.998	7.000	-0.002	7.068	0.012	2.00
10.007	10.009	-0.002	10.226	0.014	2.00

3. DISPLAY UNIT WITH TEMPERATURE

STANDARD READING (°C)	UUC READING (°C)	CORRECTION (°C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT (± °C)	COVERAGE FACTOR k
25.004	25.0	0.004	---	0.0085	2.00

4. PERCENT SLOPE 91%

UUC : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

Certificate

CALIBRATION LABORATORY CO., LTD.
2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Road, Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail: sale@cal-laboratory.com

CLC Accredited ISO/IEC 17025

ilac-MRA

NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	CONDUCTIVITY METER
MANUFACTURER	:	METTLER TOLEDO
MODEL / TYPE	:	SEVEN COMPACT S230
SERIAL NO.	:	C141708983/5821320179[CD 05/65]
CLID. NO.	:	272300452
JOB CONTROL NO.	:	260202014122

CALIBRATION SERVICE : ☑ IN-LABORATORY ☐ ON-SITE

CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24 ROAD., JOMPOL,
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 02 February 2026 DATE OF ISSUED : 04 February 2026

The report of calibration shall not be reproduced except in full without approval of the calibration Laboratory Co., Ltd.

Calibrated By : Sukgasem Seehanart
Wenick Inchaisri
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
04 February 2026

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q26014122

@clccalibration

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NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	**CONDUCTIVITY METER**
MANUFACTURER	:	**METTLER TOLEDO**
MODEL / TYPE	:	**SEVEN COMPACT S230**
SERIAL NO.	:	**C141708983/5821320179[CD 05/65]**
DATE OF CALIBRATION	:	**03 February 2026**

ENVIRONMENT CONDITIONS :

Temperature : (25 ± 2.5) °C **Relative Humidity :** (50 ± 15) % RH

PROCEDURE USED :

This instrument [Conductivity Meter] was calibrated under procedure No. **WI-305-130.**

The calibration was performed by direct measurement with Certified Reference Material (CRM) and Reference Material (RM) .

This instrument [Temperature] was calibrated by comparison with Temperature Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Conductivity Standard , Hanna Product Code HI7033L Lot Number 0101.
2. Potassium Chloride Solution, Sigma-Aldrich Canada Co Product No. 1.01203.0500.
3. Potassium Chloride Solution, Sigma-Aldrich Canada Co Product No. 1.01254.0500.
4. Temperature Bath, Jingmi Model RTS-35S S/N. 16339.
5. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03.
6. IPRT, ASL Model T100-250-1D S/N. PO106346-1-13.

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TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Hanna instruments.
Certificate No. 07D45, Due Date April 2027.
2. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co.
Lot Number. HC56384703, Due Date 31 January 2028.
3. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co.
Lot Number. HC33528554, Due Date 30 November 2026.
4. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.
Certificate No. Q25097314, Due Date 29 August 2026.
5. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0177/68, Due Date 10 February 2026.
6. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).
Certificate No. TT-1008-25, Due Date 04 March 2026.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

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CLC Accredited ISO/IEC 17025
NSC-TISI-TIS 17025 CALIBRATION 0059 CLC

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment ( ) adjustment

The table in the following gives the calibration results and associated measurement uncertainties of Conductivity Meter.

CALIBRATION DATA

1. Conductivity Solution Test @ 25°C

Standard Conductivity Solution	DUC Reading	Uncertainty of Measurement	*k* Factor
*84 µS/cm	83.95 µS/cm [Cell Constant 0.470]	± 1.15 µS/cm	2,00
1414 µS/cm	1414 µS/cm [Cell Constant 0.510]	± 21 µS/cm	2,00
12.83 mS/cm	12.83 mS/cm [Cell Constant 0.570]	± 0.19 mS/cm	2,00

Note. The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 91 of 138

* means Calibrations marked "Not TISI Accredited" in this Certificate have been included for completeness.

***2. TEMPERATURE RESULT**

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
100	25.00	25.1	-0.10	0.08

Technical Note. Type of sensor : Conductivity Probe

Probe Ø 12 mm

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2$.

Note. * means Calibrations marked "Not TISI Accredited" in this Certificate have been included for completeness.

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q26014122

F3-011-05/12-23

@clccalibration

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech_cal@yahoo.com, calibratech_cal@hotmail.com
NSC-TISI-TIS17025 CALIBRATION 0030

Certificate of Calibration

Certificate No. : 69-400023-2

Submitted by : S. P. S Consulting Service Co., Ltd.
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

Equipment : Liquid in Glass Thermometer
Manufacturer : SK Model : N/A
Range : 0 °C to 100 °C Resolution : 1 °C
Serial No. : N/A Immersion : Total
ID No. : TM21/59

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Line Voltage : (220 ± 22) VAC

Date of Received : 13 January 2026
Date of Calibration : 16 January 2026
Date of Issue : 16 January 2026
Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4001 based on ASTM E77-07 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0023-24	16 Feb 2026	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	25E1656	22 May 2027	National Institute of Metrology Thailand (NIMT)
400004	25E1656	22 May 2027	National Institute of Metrology Thailand (NIMT)

Approved by :
(Permpon Chanpu)
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech_cal@yahoo.com, calibratech_cal@hotmail.com

Certificate of Calibration

Certificate No. : 69-400023-2 **Page : 2 of 2**

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Ice point check : UUC* reading 0 °C Standard reading 0.4773 °C

Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
20.3922	20	0.4	0.31

Remark

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2 , providing a level of confidence of approximately 95%

- oOo -

CAL-F0031-03

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)

CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES

534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL.0-2717-3000-29 FAX.0-2719-9484

Certificate of Calibration

Cert.No.: 26CH202

Page.: 1 of 2

Equipment :	Turbidity Meter
Manufacturer :	Eutech
Model :	CyberScan WLTB1000
Serial No. :	201802206
ID. No. :	TB 02/50
Condition As-Received:	Used Item
Received Date :	09 February 2026
Calibration Date :	16 February 2026
Reference :	2602-0291WN-1
Submitted by :	S.P.S. Consulting Service Co.,Ltd. 7 Phaholyothin 24, Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900
Ambient Temperature :	(23 ± 3.0) °C
Relative Humidity :	(50 ± 20) %
Calibration Procedure :	In - house method : CP-CH11 Direct measurement by using Formazin standard solution
Calibrated by :	Walalak Sirithean
Approved by :	Approved Signatory

(✓) Chakrit Waewwanjua

( ) Ponpan Paipim

( ) Saithip Meangmai

Issue Date : 22 February 2026

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written Approval of the head of Calibration and Testing Equipment Services.

Condition of this calibration result

1. Reference Standard Instruments :

Instruments	ID No.	Certificate No.	Due date
1) Liquid-in Glass Thermometer	130RC114	25I972	10 Sep 2026

- This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials : Turbidity Standard solution (Formzin)
- The measurement results are traceable to SI through CPA chem Ltd.,

Turbidity Solution	Manufacturer	Lot No.	Exp. date
20.0 NTU	CPA Chem	1135349	16 Aug 2026
40.0 NTU	CPA Chem	1135350	16 Aug 2026
100.0 NTU	CPA Chem	1135352	16 Aug 2026
400 NTU	CPA Chem	1135360	16 Aug 2026

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration result

Performing three - Formazin suspension standard curve by using 0, 10, 1000 NTU
Tubidity Meter serial number : 201802206

Standard Formazine suspension (NTU)	UUC* Reading (NTU)	Uncertainty of Measurement (± NTU)	Coverage Factor *k*
20.0	19.8	0.20	2.00
40.0	40.5	0.28	2.00
100.0	101	1.2	2.00
400	392	2.3	2.00

Remark **- UUC* = Unit Under Calibration**
- NTU = Nephelometric Turbidity Units

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor *k* , providing a level of confidence of approximately 95 %.

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QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com

ilac-MRA NSC-TISI-TIS17025 CALIBRATION 0049

CERTIFICATE No : 26M2268
REFERENCE No : 80204-3

Certificate of Calibration

EQUIPMENT	:	DIGITAL BALANCE
MANUFACTURER	:	SARTORIUS
MODEL	:	BSA224S-CW
SERIAL No	:	36591843
ID No	:	BA 09/61
CONDITION AS RECEIVED	:	USED ITEM
SUBMITTED BY	:	S.P.S. CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD., JOMPOL, CHATUCHAK, BANGKOK 10900
CALIBRATED BY	:	SUCHAT S.
CALIBRATION DATE	:	05-Mar-26
APPROVED BY	:	PONGSAK J.
ISSUED DATE	:	06-Mar-26
RECEIVED DATE	:	05-Mar-26

Certificate

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.

QUALITY CALIBRATION CO.,LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com

CERTIFICATE No : 26M2268

Calibration Report

EQUIPMENT	:	DIGITAL BALANCE	**MODEL**	:	BSA224S-CW
MANUFACTURER	:	SARTORIUS	**S/N**	:	36591843
ID No	:	BA 09/61	**RECEIVED DATE**	:	05-Mar-26
AIR PRESSURE	:	1004mbar ± 1mbar	**CALIBRATION DATE**	:	05-Mar-26
AMBIENT TEMPERATURE	:	25° C ± 1° C	**RELATIVE HUMIDITY**	:	50 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY ACCORDING TO UKAS LAB 14 EDITION 6:2019 BY USING KNOWN WEIGHT STANDARD WEIGHT. THE BALANCE WAS NOT ADJUSTED BEFORE CALIBRATION. THE BALANCE HAS NO ZERO TRACKING FUNCTION. REPEATABILITY WAS MEASURED BY USING 10 REPEATED MEASUREMENTS. LINEARITY WAS MEASURED COVERING 10 POINTS, EVENLY SPREAD OVER THE RANGE. THE INSTRUMENT WAS SET ZERO BEFORE PERFORMING THE LINEARLITY TEST. OFF-CENTER LOADING WAS MEASURED BY USING STANDARD WEIGHTS PLACED ON THE PAN AND MOVED TO VARIOUS POSITIONS ON THE PAN.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) STANDARD WEIGHT SET	E2	QK-I-151	C02250116	28-Jan-27
2) STANDARD WEIGHT	E2	15843	C02250117	29-Jan-27

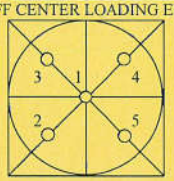
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
   - NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL
2. TARE FUNCTION : NORMAL
3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g
4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (± g)
0.0	0.0000	0.0000	0.00010
0.1	0.1000	0.0000	0.00011
0.2	0.2000	0.0000	0.00010
0.5	0.5000	0.0000	0.00011
1.0	1.0000	0.0000	0.00011
2.0	2.0000	0.0000	0.00011
5.0	5.0000	0.0000	0.00011
10.0	10.0000	0.0000	0.00011
20.0	20.0001	-0.0001	0.00011
50.0	50.0000	0.0000	0.00013
100.0	100.0001	-0.0001	0.00019
200.0	200.0001	-0.0001	0.00032

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	100.0000
2	100.0000
3	100.0000
4	100.0000
5	100.0000
OFF-CENTER LOADING	0.0000

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584
www.qcalibration.com

CERTIFICATE No : 26T0464
REFERENCE No : 79659-1

Certificate of Calibration

EQUIPMENT	:	COD REACTOR
MANUFACTURER	:	HACH
MODEL	:	DRB 200
SERIAL No	:	15110C0497
ID No	:	DRB 04/59
SUBMITTED BY	:	S.P.S. CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD., JOMPOL, CHATUCHAK, BANGKOK 10900
CALIBRATED BY	:	SOMCHAI S.
CALIBRATION DATE	:	30-Jan-26
APPROVED BY	:	PONGSAK J.
ISSUED DATE	:	30-Jan-26
RECEIVED DATE	:	30-Jan-26

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF QUALITY CALIBRATION CO., LTD.

QUALITY CALIBRATION CO., LTD.
235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160
Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 26T0464

Calibration Report

EQUIPMENT	:	COD REACTOR			
MANUFACTURER	:	HACH	**MODEL**	:	DRB 200
ID NUMBER	:	DRB 04/59	**SERIAL NUMBER**	:	15110C0497
RECEIVED DATE	:	30-Jan-26	**CALIBRATION DATE**	:	30-Jan-26
AMBIENT TEMPERATURE	:	23° C ± 1° C	**RELATIVE HUMIDITY**	:	54 %RH ± 10 % RH

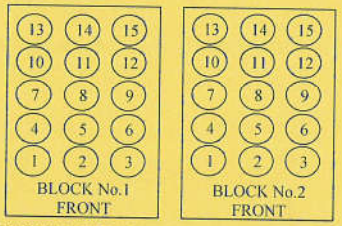
CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASURMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE .
2. REFERENCE STANDARD INSTRUMENTS :-

	INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1)	DATA LOGGER WITH TC TYPE K	HYDRA 2635A	6849323	25T5342	18-Jun-26

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
   - NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

Block No.		1	2
Controller temperature (°C)		144	145
Indicating Temperature		144	145
Measured Temperature (° C) at Spread Locations	1	149.3	149.8
	2	149.1	149.9
	3	149.9	149.6
	4	150.0	149.3
	5	149.8	149.5
	6	149.9	149.1
	7	149.7	149.7
	8	149.5	149.9
	9	149.8	149.4
	10	148.5	149.4
	11	149.1	150.2
	12	149.2	150.0
	13	149.0	149.6
	14	149.1	150.3
	15	148.5	149.0
Uncertainty of Measurement(± °C)		0.89	0.89

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.
NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT

Quality Certificate

HARIKUL SCIENCE

Harikul Science Co.,Ltd.
694 Soi Ratchadanivet 24, Pracharatbamphen,
Samsaennok, Huaikhwang, Bangkok 10310
Tel: 0-2274-2456 Fax: 0-2274-2443
Email: info@harikul.com www.harikul.com

Certificate of Calibration

CERT.No.: HS-X014C

Calibration Date : 16 March 2026
Submitted by : S.P.S CONSULTING SERVICE CO.,LTD
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,
Chatuchak, Bangkok, Thailand 10900

Avg Room Temp : 20 °C
Avg Water Temp : 20 °C
Air Pressure : 760.00 mmHg
Salinity : 0 ppt

Model : YSI 5000
S/N : 15B100751
Probe : YSI 5010
S/N : 22D100097
ID NO. :
Air Temp ref : S/N. F8065C26
Barometric ref : S/N. F8065C26
Water Temp ref : -
ID NO. HS001
Technician : Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)		(status)
Measurement 1 (mg/l)	9.09	(PASS)	-	-
Measurement 2 (mg/l)	9.09	(PASS)	-	-
Measurement 3 (mg/l)	9.09	(PASS)	-	-
Measurement 4 (mg/l)	9.09	(PASS)	-	-
Measurement 5 (mg/l)	9.09	(PASS)	-	-
Measurement 6 (mg/l)	9.08	(PASS)	-	-
Measurement 7 (mg/l)	9.08	(PASS)	-	-
Measurement 8 (mg/l)	9.08	(PASS)	-	-
Measurement 9 (mg/l)	9.08	(PASS)		-
Measurement 10 (mg/l)	9.08	(PASS)	-	-
Mean Measurement	9.09	mg/l	-	-
Inaccuracy	0.00	mg/l	-	-
Overall Status	(PASS)			

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

1) This certificate is issued based on the result that are found as shown on date and place of test only.
2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
3) This result shall not be used for advertising purpose.

Technician Signature
(Kittipong Maekwong)

Laboratory Manager
(Natenapha Pisatkunchon)

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

NSC-TISI-TIS 17025
CALIBRATION 0394

Cert. No. : SP25026
Pages : 1 of 4

Calibration Certificate

Equipment :	UV-VIS SPECTROPHOTOMETER
Manufacturer :	PERKINELMER
Model :	LAMBDA 25
Serial No.:	501S14123010
ID No.:	SP03/58
Calibration Mode :	WAVELENGTH ACCURACY PHOTOMETRIC ACCURACY STRAY LIGHT
Condition As Found :	GOOD
Customer :	S.P.S CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD, CHOMPHON SUB-DISTRICT, CHATUCHAK DISTRICT, BANGKOK PROVINCE 10900 THAILAND.
Location :	ORGANIC LABORATORY IV
Ambient Temperature :	(22.9 ± 5) °C
Relative Humidity :	(53.7 ± 25) %
Received Date :	22 AUGUST 2025
Calibration Date :	22 AUGUST 2025
Date of Issue :	25 AUGUST 2025

Calibrated by : Nitinun Srihawan

Approved by : Wichok B.
(Wichok Ekpongpradit)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 2 of 4

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01
The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution
The calibration procedure used was based on ASTM E275-01,ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	126461	24/10/2026
Didymium liquid	RM-DL	28912	126462	24/10/2026
Neutral density filter	RM-1N2N3N	13877	126457	24/10/2026
Potassium dichromate solutions	RM-0204060810	14204	126497	25/10/2026
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

2. This result of calibration was found accurate as shown on date and place of calibration only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 The UK National Physical Laboratory (NPL)

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	*k* Factor
RM-HL	278.13	278.21	0.08	0.16	2.00
	361.25	361.39	0.14	0.16	2.00
	467.82	467.71	-0.11	0.16	2.00
	536.56	536.50	-0.06	0.16	2.00
	640.50	640.36	-0.14	0.16	2.00
RM-DL	740.09	739.85	-0.24	0.16	2.00
	864.94	865.12	0.18	0.16	2.00

UUC* = Unit Under Calibration

Wichok B.

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 3 of 4

Result of calibration : Photometric Accuracy

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	*k* Factor
Neutral Density glass filter	440.0	29381	0.5	0.5443	0.5413	-0.0030	0.0043	2.00
		29914	0.7	0.7484	0.7455	-0.0029	0.0054	2.00
		29360	1.0	1.0527	1.0535	0.0008	0.0032	2.00
	465.0	29381	0.5	0.4948	0.4922	-0.0026	0.0041	2.00
		29914	0.7	0.6906	0.6877	-0.0029	0.0050	2.00
		29360	1.0	0.9695	0.9709	0.0014	0.0031	2.00
	546.1	29381	0.5	0.5090	0.5068	-0.0022	0.0036	2.00
		29914	0.7	0.6985	0.6960	-0.0025	0.0041	2.00
		29360	1.0	0.9814	0.9825	0.0011	0.0031	2.00
	590.0	29381	0.5	0.5375	0.5353	-0.0022	0.0034	2.00
		29914	0.7	0.7256	0.7231	-0.0025	0.0037	2.00
		29360	1.0	1.0213	1.0219	0.0006	0.0032	2.00
	635.0	29381	0.5	0.5223	0.5202	-0.0021	0.0033	2.00
		29914	0.7	0.6927	0.6901	-0.0026	0.0036	2.00
		29360	1.0	0.9744	0.9750	0.0006	0.0032	2.00

UUC* = Unit Under Calibration

Michou B.

SITHIPORN associates
SITHIPORN ASSOCIATES
CALIBRATION LABORATORY

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 4 of 4

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	*k* Factor
Potassium dichromate solutions	235.0	20	0.2415	0.2443	0.0028	0.0101	2.00
		40	0.4866	0.4871	0.0005	0.0115	2.00
		60	0.7415	0.7295	-0.0120	0.0067	2.00
		80	0.9854	0.9844	-0.0010	0.0071	2.00
		100	1.2444	1.2425	-0.0019	0.0073	2.00

UUC* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model LAMBDA 25 S/N 501S14123010

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	190 nm - 1100 nm
Scanning Speed	7.5 nm/min
Band width(Wavelength)	1.0
Band width(Vis)	1.0
Band width(Uv)	1.0

Stray Light** UUC* Reading at 220.0 nm	
Transimission T(%)	**Absorbance(A)**
0.020	3.7032

**Specific Acceptance :
Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A
**Stray light not TISI Accredited

The reported uncertainty is based on a standard uncertainty mutiplied by a coverage factor *k*, providing a level of confidence of approximately 95%

End of Calibration Certificate

PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

Customer :	S.P.S. Consulting Service Co.,Ltd.	**Date Tested:**	June 18, 2026
		Recommendation Recertification	
Address :	7, 24 Soi Phaholyothin, Ladyao,	**Period**	6 **Months**
		Recertification Due:	June 18, 2027
	Khet, Bangkok 10900	**Date Last Certified:**	N/A
User Name:	K. Phenpha	**Visit Number:**	1 of 2
Phone:	083-926-9252	**PerkinElmer Phone:**	02-719-6420 ext 206
E - Mail :	phenpha@spscon.com	**PerkinElmer Fax:**	02-318-5597

CONFIGURATION TESTED

MODEL	SERIAL NUMBER	SOFTWARE
Optima5300	077C7042401	Winlab32

TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
IPV Method	N/A	N/A

TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Multielement Standard	N069-1579	Dec-26
Instrument Cal. STD4	N930-0221	Dec-26

CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3	N/A	N/A
10 % HNO3	N/A	N/A

WO-11962532

PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

SERIAL NUMBER: 077C7042401 **DATE TESTED:** June 18, 2026

1. MECHANICAL CHECKS	
A. Inspect and clean all fans and filters.	OK
B. Inspect and replace as necessary, all torch components including the RF coil.	OK
C. Inspect all tubing for sign of clacking or leaking.	OK
D. Adjust water and gas pressure regulator settings.	OK
E. Inspect and leak check pneumatics drawers.	OK
F. Clean the exterior of the instrument.	OK
2. OPTICAL CHECKS	
A. Inspect and clean all optical components.	OK
B. As reqiured, check and replace all purgebfilters.	OK
C. Recheck optical alignment.	OK
3. COOLING SYSTEM CHECKS	
A. Perform preventive maintenance on chiller.	OK
B. Flush out the chiller every year.	OK
4. PERFORMANCE CHECKS	
A. Torch View Alignment.	OK
B. Wavelength Calibration.	OK

PerkinElmer Ltd. 290 Soi 17 Rama 9 Road, Khwang Bangkapi, Khet Huay Kwang, Bangkok 10310, Thailand

PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

SERIAL NUMBER: 077C7042401 **DATE TESTED:** June 18, 2026

PARAMETER		SPECIFICATION		FINAL VALUE	
Spectral Resolution : UV					
	As 193.696 nm	≤ 0.009	nm	0.006	nm
	Ni 231.604 nm	≤ 0.011	nm	0.008	nm
	Ni 341.476 nm	≤ 0.015	nm	0.011	nm
Spectral Resolution : VIS					
	Ba 455.403 nm	≤ 0.020	nm	0.015	nm
Precision					
	Zn 206.200 nm	% RSD	≤ 1.0 %	0.39	%
	Mg 280.271 nm	% RSD	≤ 1.0 %	0.41	%
	Mg 285.213 nm	% RSD	≤ 1.0 %	0.31	%
	Ba 455.403 nm	% RSD	≤ 1.0 %	0.68	%
Detection Limits : Axial					
	Tl 190.801 nm	3(sd)	<10	9.23	ppb
	As 193.696 nm	3(sd)	<10	6.78	ppb
	Se 196.026 nm	3(sd)	<5	4.12	
	Pb 220.353 nm	3(sd)	<3	2.34	ppb
Detection Limits : Radial				1.23	
	As 193.696 nm	3(sd)	<60	55.23	ppb
	Zn 213.857 nm	3(sd)	<2	1.03	ppb
	Mn 257.610 nm	3(sd)	<0.75	0.65	ppb
	La 379.478 nm	3(sd)	<3	3.15	ppb
	Ba 455.403 nm	3(sd)	<0.3	0.23	ppb
	Ba 493.408 nm	3(sd)	<0.6	1.11	ppb
BEC : Axial (IB X 1000)/(IS-IB)					
	Mn 257.610 nm	≤ 30 ppb		15.87	ppb
BEC : Radial (IB X 1000)/(IS-IB)					
	Mn 257.610 nm	≤ 30 ppb		10.35	ppb

PerkinElmer Ltd. 290 Soi 17 Rama 9 Road, Khwang Bangkapi, Khet Huay Kwang, Bangkok 10310, Thailand

WO-11962532

PerkinElmer

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

Optima 5300

SERIAL NUMBER: 077C7042401 **DATE TESTED:** June 18, 2026

Remarks :

Test all pass

This is to certify that the above tests have been perfomed and the configuration tested

☑ meets

☐ does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale, including warranty terms.

Service Department PerkinElmer Ltd.

Customer Service Engineer: Chayanan K.

(Chayanan Kanan)

Sr. Customer Support Engineer

PerkinElmer Ltd. 290 Soi 17 Rama 9 Road, Khwang Bangkapi, Khet Huay Kwang, Bangkok 10310, Thailand

MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD
214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th

ilac-MRA

ISO/IEC 17025 CALIBRATION 0052

CALIBRATION CERTIFICATE

Certificate No. : S2025070410-0002

Date Issued : 24-Jul-25

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment : Incubator

Manufacturer : BINDER
Model : BD 240
Serial No. : 12-17739
ID No./Tag No. : IN 04/56
Date Received : 22-Jul-25
Date Calibrated : 22-Jul-25

Calibrated by : Auttapol Kunaumpal

Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor k = 2, providing a level confidence approximately 95 percent.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by: K. Nathapong (Nathapong Krudaum)

CERTIFIED MIT

Certificate No. : S2025070410-0002

Environment : Ambient Temperature : Start record 25.1 °C, Stop record 25.1 °C
Relative Humidity : Start record 48.9 %RH, Stop record 49.3 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability[1] (°C)	Measured Uniformity[2] (°C)	Overall Variation[3] (°C)
35	35.0	35.0	0.12	0.35	0.40

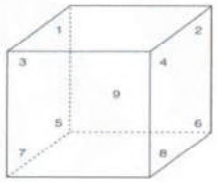
Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty[4] (±°C)
35	34.91	34.82	34.86	34.88	34.75	34.74	34.89	34.87	34.91	0.23

STD = Standard

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. OFF



Condition As-Received : Used Item

The measurment results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202412300-0027 for Temperature Indicator with Sensor Serial No. US37020317, Due 09-Sep-25

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.
3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
4. The uncertainty of measurement is included temperature stability.
5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate

PinAAcle 900T Preventive Maintenance Report

Company Name: S.P.S. Consulting Service Co.,Ltd.

Instrument Location: 7, 24 Soi Phaholyothin,

Ladyao, Khet, Bangkok 10900

Instrument Serial No.: PTCS14111103

Date: 18 Jun 2026

PinAAcle 900T Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd.		
Address (Instrument Location):	7, 24 Soi Phaholyothin, Ladyao, Khet, Bangkok 10900		
Serial Number:	PTCS14111103	**PM Number:**	1 of 2
Customer Name (if applicable):	K. Phenpha	**Telephone Number:**	083-926-9252
Customer Support Engineer Name:	K. Chayanan	**Service Order Number:**	WO-11540403
Date PM Performed: (DD-MMM-YYYY)	18 Jun 2026	**Next PM Due Date:** (DD-MMM-YYYY)	18 Jun 2027
Standard Labor Hours to Complete PM :		**5 hours**	

Part Number	Release	Publication Date
09370143 Rev.9	A	January 2018

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900T by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
PinAAcle900T	PTCS14111103	Winlab32
Fias100	100S14090404	Winlab32

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	**Description**	**Quantity**
B0501696	Fan Filters	1
B3002013	THGA Contact Cylinders	1
B3141064	Glycerol for THGA Cooling	1
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	2
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	1

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	**Description**	**Quality**	**Batch/Lot #**	**Expired Date (MM/YY)**
N9300183	1000 mg/L Copper Standard	AR	28-83CUY1	Nov 26
N9300244	GFAAS Mixed Standard	AR	60-004CRY1	Jun 26

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	**Description**	**Quantity**	**Batch/Lot #**	**Expiration Date (MM/YY)**
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% $HN0_3$	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	**Description**	**Quantity**	**Serial #**
N1013000	0.2A Neutral density filter	1	101N0089015
N1013002	1.0A Neutral density filter	1	101N0089015
B3100652 Or N9307029	Electronic Flow Meter	1	NA
B0505495	Test Jig	1	NA
03030997	System 2 EDL Driver	1	030309-97E
N3050605	As System 2 EDL	1	000003-26798A
N3050121	Cu Lumina HCL	1	060419-030180
N3050109	Ba Lumina HCL	1	061219-020041
N3050139	K Lumina HCL	1	030819-010130
N3050152	Ni Lumina HCL	1	052719-020020
N3050119	Cr Lumina HCL	1	060419-030180

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. **General:**

   ☑ Review the instrument performance with the customer and document any recent problems.
   ☑ Inspect the customer log book and make any appropriate PM entries.
   ☑ Perform general inspection of system for cleanliness.

2. **PC Instrument Software:**

   ☑ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. **Mechanical:**

   ☑ Inspect and clean all fans and filters. Replace filters if necessary
   ☑ Inspect all gas and water lines for leaks and/or wear. Replace if needed. Thoroughly inspect all quick connects. Replace the Y connector, P/N 09921079, if needed.
   ☑ Clean exterior of the instrument.

   3.1 Flame Technique
   ☑ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
   ☑ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
   ☑ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
   ☑ Check the drain system for signs of wear. Replace worn or damaged parts.
   ☑ Visually check for proper flame conditions when igniting the Air-C2H2 and N20-C2H2 flames (if applicable).

   3.2 THGA Technique
   ☑ Inspect the pole pieces and clean where the pole pieces contact the furnace. Replace the pole piece p-rings as needed, P/N's B0501018 & B0501250. Grease the O-rings as needed with Apiezon L grease, P/N 09905148
   ☑ Inspect the four insulation pads on the front contact housing of the THGA in furnace. If the pads are missing replace the THGA furnace or replace the insulator pads on the furnace.
   ☑ Inspect the graphite tube and clean the contact cylinders. Replace if necessary.
   ☑ Check internal and external gas flows with the Electronic Gas Flow Meter and the Gas Flow Test Probe as described in the Service Manual. Correct if necessary.
   ☑ Check furnace open/close function.
   ☑ Verify the operation of the GFTV Camera for proper operation and viewing alignment in the furnace camera Tube View window. Align if needed.
   ☑ Check the operation of the Halogen Light ASSY for the GFTV Camera. Replace if needed.
   ☑ Check the water level/quality in the recirculation (if applicable). Add distilled water if necessary.
   ☑ Check the cooling system fluid flow rate with the FCS In-Line Flow Meter for proper levels if needed. Refer to SDB# COSY008.STN

   ☑ Perform Cooling System maintenance if needed per SDB# COSY005.STN.
   ☑ Check auto sampler operation.
   ☑ Perform an auto sampler check valve test as described in the Service Manual.
   ☑ Lubricate the spindles of the auto sampler pumps and all moving parts of the tray mechanics as described in the Service Manual.
   ☑ Inspect the auto sampler sampling capillary as described in the Service Manual. Replace if necessary.

4. **Electrical:**

   ☑ Inspect PC boards. Clean if necessary.
   ☑ Carefully check all internal and external cable connections.
   ☑ Check instrument firmware revisions upgrade to current levels (if necessary)
   ☑ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. **Optics:**

   ☑ Inspect and clean the sample compartment windows, if needed.
   ☑ Inspect and clean the furnace windows, if needed.
   ☑ Inspect and clean the GFTV camera lens, if needed.
   ☑ Inspect optics. Clean or replace if necessary,

6. **Gasses:**

   ☑ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
   ☑ Verify that the air filter element is dry. Replace if necessary.

7. **Flame Interlock Check:**

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
C_2H_2 Pressure Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests [Flame]:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	2.0405	1.9997	Passed
0.2 A ND Filter	± 5% from Cert.	0.1953	0.1855	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.001	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

8.4 D_2 Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0001	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0003	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0001	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.356	Passed

9. After PM Performance tests [THGA]:

9.1 Furnace Gas Flows

Description: Ensures the flow rates are within specification.

Parameter	Specification	Test Results	Pass/Fail
Internal Flow Rate	250 mL/min ± 25 mL/min	260	Passed
External Flow Rate	100 mL/min ± 10 mL/min	105	Passed

9.2 Chromium Baseline Noise

Description: Signal to noise check.

Parameter	Specification	Results	Pass/Fail
Baseline Noise	≤ 0.005 Abs.	0.0002	Passed
Standard Deviation	≤ 0.005	0.0001	Passed

9.3 Chromium Characteristic Mass and Precision

Description: Calculate the characteristic mass using the characteristic mass tool and precision from the integrated absorbance values.

Parameter	Specification	Results	Pass/Fail
Cr m_0 Results	≤ 7.0 pg/0.0044 A-s	5.4	Passed
Precision	≤ 2.0 %	0.14	Passed

9.4 Copper Characteristic Mass and Zeeman Ratio

Description: Calculate the characteristic mass using the characteristic mass tool and check the Zeeman Ratio.

Parameter	Specification	Results	Pass/Fail
Cu m_0 Result	≤ 16.5 pg/0.0044 A-s	14.5	Passed
Zeeman Ratio	0.52 ± 0.04	0.54	Passed

10. Review:

☑ Review with the customer PM work performed.
☑ Review with the customer routine maintenance procedures.
☑ Discuss recommended customer supplied materials to have on hand.
☑ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM
Zeeman Ratio $= \frac{Atomic\ Signal\ (Peak\ area\ )}{Atomic\ Signal\ (Peak\ area\ ) + Background\ Signal\ (Peak\ area\ )}$ $= \frac{0.1551}{0.1551+0.1315}$ $= 0.54$

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900T have been completed.

This PinAAcle 900T Passes ☑ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: Chayaran K.	Date: 18 Jun 2026 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: 18 Jun 2026 (DD-MMM-YYYY)

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR25100063-9

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	: Area Heat Stress Monitor		
Manufacturer	: Quest Technologies		
Model	: QUESTemp 34		
Serial Number	: TEH060047		
ID. Number	: B05		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 06 Oct 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 29 Oct 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 29 Oct 2026
Calibration Procedure	: SP-CPT-04-13	Date of Issue	: 30 Oct 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Surasak Ritthikaew
Calibration Officer

Approved by

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

(Mr.Worapong Sinthusopa)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
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Calibration Report

Certificate Number : SPR25100063-9

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010 13	20 Apr 2026

Traceability

This certification is traceable to the International System of Unit maintained at :
NA - NA Caltechnologies Co., Ltd.
SP Metrology - SP Metrology system (Thailand) Co.Ltd.

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Result of Calibration

Certificate Number : SPR25100063-9 Page : 3 of 3

Temperature Accuracy in the Measurement. (WET) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.018	30.1	0.082	0.20
35.0	35.014	35.1	0.086	0.20
40.0	40.011	40.1	0.089	0.21

Temperature Accuracy in the Measurement. (DRY) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.021	30.1	0.079	0.20
35.0	35.015	35.0	-0.015	0.20
40.0	40.010	40.0	-0.010	0.21

Temperature Accuracy in the Measurement. (GLOVE) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.022	30.1	0.078	0.20
35.0	35.018	35.1	0.082	0.20
40.0	40.013	40.1	0.087	0.21

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
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Certificate of Calibration

Certificate Number : SPR25100063-10 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name : Area Heat Stress Monitor
Manufacturer : Quest Technologies
Model : QUESTemp 32
Serial Number : TPA100010
ID. Number : B12

Environmental Conditions

Ambient Temperature : 23 °C ± 2 °C
Relative Humidity : 50 % ± 15 %
Location of Calibration : In-Lab
Calibration Procedure : SP-CPT-04-13

Received Date : 06 Oct 2025
Calibration Date : 29 Oct 2025
Recommend Due Date : 29 Oct 2026
Date of Issue : 30 Oct 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Surasak Ritthikaew
Calibration Officer

Approved by

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

(Mr.Worapong Sinthusopa)
Authorized Signatory

Calibration Report

Certificate Number : SPR25100063-10

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010-13	20 Apr 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

NA - NA Caltechnologies Co., Ltd.

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Result of Calibration

Certificate Number : SPR25100063-10

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.019	30.1	0.081	0.20
35.0	35.013	35.1	0.087	0.20
40.0	40.009	40.0	-0.009	0.21

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.022	30.1	0.078	0.20
35.0	35.016	35.1	0.084	0.20
40.0	40.010	40.0	-0.010	0.21

Temperature Accuracy in the Measurement. (GLOVE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.024	30.1	0.076	0.20
35.0	35.019	35.1	0.081	0.20
40.0	40.011	40.1	0.089	0.21

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

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Certificate of Calibration

Certificate Number : SPR25100063-7 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	: Area Heat Stress Monitor		
Manufacturer	: Quest Technologies		
Model	: QUESTemp 34		
Serial Number	: TEF050029		
ID. Number	: B17		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 06 Oct 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 21 Oct 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 21 Oct 2026
Calibration Procedure	: SP-CPT-04-13	Date of Issue	: 22 Oct 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Jirasak Pumbut
Calibration Officer

Approved by

(Mr.Poothipong A.)
Authorized Signatory

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
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Calibration Report

Certificate Number : SPR25100063-7 Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010-13	20 Apr 2026

Traceability

This certification is traceable to the International System of Unit maintained at :
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Result of Calibration

Certificate Number : SPR25100063-7 Page : 3 of 3

Temperature Accuracy in the Measurement. (WET) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.007	29.9	-0.107	0.20
35.0	35.009	34.9	-0.109	0.20
40.0	40.005	39.9	-0.105	0.21

Temperature Accuracy in the Measurement. (DRY) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.007	30.2	0.193	0.20
35.0	35.009	35.2	0.191	0.20
40.0	40.005	40.2	0.195	0.21

Temperature Accuracy in the Measurement. (GLOVE) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.007	30.0	-0.007	0.20
35.0	35.009	34.9	-0.109	0.20
40.0	40.005	39.9	-0.105	0.21

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.
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Certificate of Calibration

Certificate Number : SPR26010387-3 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	:	Area Heat Stress Monitor			
Manufacturer	:	Metrosonics			
Model	:	hs-32			
Serial Number	:	MCE030011			
ID. Number	:	B21			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 2 °C	Received Date	:	30 Jan 2026
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	03 Feb 2026
Location of Calibration	:	In-Lab	Recommend Due Date	:	03 Feb 2027
Calibration Procedure	:	SP-CPT-04-13	Date of Issue	:	04 Feb 2026

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Jirasak Pumbut
Calibration Officer

Approved by

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

(Mr.Worapong Sinthusopa)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Calibration Report

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2027
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010-13	20 Apr 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

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METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Result of Calibration

Temperature Accuracy in the Measurement. (WET) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.7	-0.309	0.20
35.0	35.012	34.7	-0.312	0.20
40.0	40.017	39.8	-0.217	0.21

Temperature Accuracy in the Measurement. (DRY) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.6	-0.409	0.20
35.0	35.012	34.6	-0.412	0.20
40.0	40.017	39.7	-0.317	0.21

Temperature Accuracy in the Measurement. (GLOBE) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.7	-0.309	0.20
35.0	35.012	34.7	-0.312	0.20
40.0	40.017	39.8	-0.217	0.21

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

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Certificate of Calibration

Certificate Number : SPR25100063-8 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name : Area Heat Stress Monitor
Manufacturer : 3M
Model : QUESTemp°32
Serial Number : TPK040059
ID. Number : B22

Environmental Conditions

Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 06 Oct 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 21 Oct 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 21 Oct 2026
Calibration Procedure	: SP-CPT-04-13	Date of Issue	: 22 Oct 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.
The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Jirasak Pumbut
Calibration Officer

Approved by

(Mr.Pootthipong A.)
Authorized Signatory

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

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METROLOGY SYSTEM (THAILAND) CO.,LTD.
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Calibration Report

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2500342	29 Jan 2026
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1011	SPR25040010-13	20 Apr 2026

Traceability

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Result of Calibration

Certificate Number : SPR25100063-8 Page : 3 of 3

Temperature Accuracy in the Measurement. (WET) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	30.0	-0.009	0.20
35.0	35.008	35.0	-0.008	0.20
40.0	40.007	40.0	-0.007	0.21

Temperature Accuracy in the Measurement. (DRY) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.9	-0.109	0.20
35.0	35.008	34.9	-0.108	0.20
40.0	40.007	39.9	-0.107	0.21

Temperature Accuracy in the Measurement. (GLOVE) Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.9	-0.109	0.20
35.0	35.008	34.9	-0.108	0.20
40.0	40.007	39.9	-0.107	0.21

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.
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Certificate of Calibration

Certificate Number : SPR26030173-2 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	:	Area Heat Stress Monitor			
Manufacturer	:	Quest Technologies			
Model	:	QUESTemp 34			
Serial Number	:	TPH050041			
ID. Number	:	B26			
Environmental Conditions					
Ambient Temperature	:	23 °C ± 2 °C	Received Date	:	11 Mar 2026
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	14 Mar 2026
Location of Calibration	:	In-Lab	Recommend Due Date	:	14 Mar 2027
Calibration Procedure	:	SP-CPT-04-13	Date of Issue	:	15 Mar 2026

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs. The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Witthawat Jansuwan
Calibration Officer

Approved by

(Mr.Worapong Sinthusopa)
Authorized Signatory

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

Calibration Report

Certificate Number : SPR26030173-2

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
THERMO-HYGROMETER	5020A	A47046	TMU2600443	01 Feb 2027
Temp & Humidity Test Chamber	TEMI1500-01/SD/N/N/	S7110ZL742 1014	SPR25040010-13	20 Apr 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

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METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Result of Calibration

Certificate Number : SPR26030173-2

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.013	30.1	0.087	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.015	40.1	0.085	0.21

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.013	30.0	-0.013	0.20
35.0	35.012	35.1	0.088	0.20
40.0	40.015	40.1	0.085	0.21

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.013	30.1	0.087	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.015	39.9	-0.115	0.21

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2, providing a level of confidence approximately 95%.

- End of Certificate -

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S.P.S. CONSULTING SERVICE CO., LTD.
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

Heat B_172_1

Heat Stress WBGT Meter Verification Report

Verification Data

Heat Stress WBGT Meter No.	:	B05	Verification Date	:	21 April 2026	
Brand	:	Quest Technologies	Ambient Temp.	:	24.5	°C
Model	:	QUESTemp°34	Barometric Pressure	:	1011	mmbar
Serial No.	:	TEH060047	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :

Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.4	0.1	± 0.5

Dry Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.1	0.0	± 0.5

Globe Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.4	-0.1	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

Heat B_172_2

Heat Stress WBGT Meter Verification Report

Verification Data

Heat Stress WBGT Meter No.	:	B12	Verification Date	:	21 April 2026	
Brand	:	Quest Technologies	Ambient Temp.	:	24.5	°C
Model	:	QUESTemp°32	Barometric Pressure	:	1011	mmbar
Serial No.	:	TPA100010	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :

Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5

Dry Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.1	0.0	± 0.5

Globe Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
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Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com.. www.spscon.com

Heat B_172_3

Heat Stress WBGT Meter Verification Report

Verification Data

Heat Stress WBGT Meter No.	:	B17	Verification Date	:	21 April 2026	
Brand	:	Quest Technologies	Ambient Temp.	:	24.5	°C
Model	:	QUESTemp°34	Barometric Pressure	:	1011	mmbar
Serial No.	:	TEF050029	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :

Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.5	0.0	± 0.5

Dry Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.3	-0.2	± 0.5

Globe Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com.. www.spscon.com

Heat B_172_4

Heat Stress WBGT Meter Verification Report

Verification Data

Heat Stress WBGT Meter No.	:	B21	Verification Date	:	21 April 2026	
Brand	:	METROSNICS	Ambient Temp.	:	24.5	°C
Model	:	hs-32	Barometric Pressure	:	1011	mmbar
Serial No.	:	MCE030011	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :

Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5

Dry Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.1	0.0	± 0.5

Globe Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.1	0.2	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
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Heat B_172_1

Heat Stress WBGT Meter Verification Report

Verification Data

Heat Stress WBGT Meter No.	:	B22	Verification Date	:	21 April 2026	
Brand	:	3M	Ambient Temp.	:	24.5	°C
Model	:	QUESTemp°32	Barometric Pressure	:	1011	mmbar
Serial No.	:	TPK040059	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :

Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.7	-0.2	± 0.5

Dry Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.1	0.0	± 0.5

Globe Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72 Fax : (662) 513-4221 E-mail : sale@spscon.com, www.spscon.com

Heat B_172_1

Heat Stress WBGT Meter Verification Report

Verification Data

Heat Stress WBGT Meter No.	:	B26	Verification Date	:	21 April 2026	
Brand	:	Quest Technologies	Ambient Temp.	:	24.5	°C
Model	:	QUESTemp°34	Barometric Pressure	:	1011	mmbar
Serial No.	:	TPH050041	Relative Humidity	:	49	%

Verification Module (Electronic Sensor Check) :

Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C

Result of Verification : Without Adjustment

Wet Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5

Dry Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	46.9	0.2	± 0.5

Globe Probe Temperature Measurement

Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5

UUC* = UNIT UNDER CALIBRATION

Verified by : Adul Dangklom (Mr.Adul Dangklom)

Approved by : (Mr. Peera Detudom)

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204 **MTC No.** EEL. BP. 152/0169

CALIBRATION CERTIFICATE

Submitted by : S.P.S.CONSULTING SERVICE CO.,LTD.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

Temperature : (23 + 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015 P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan, Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road, Ladyao, Chatuchak, Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827

NSC-TISI-TIS 17025
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204 **MTC No.** EEL. BP. 152/0169

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20μPa at 1000 Hz

Acoustic Output in dB re 20μPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.89	-0.11	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	± 1.5	±1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.90	± 0.50	±3.0%

Note : 1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was not included.

Calibrated by : .....
(Mr.Weerachai Deechaiyae)

Approved by : .....
(Mr.Prawate Kluaypa)
Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 20112690129004970O1

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

Head Office
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Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
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Office
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(66) 08 1889 6827

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sales@spscon.com., www.spscon.com

Noise B_171/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data			
Brand	ACO	Number	AC 03/56
Model	2127	Serial No.	130006
Calibration Range	94 dB, 1000 Hz	Last Calibration	11 February 2026
		Due Date	11 February 2027

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B04	ACO	6236	00222298	21 April 2026	93.9	93.9
ACO-B05	ACO	6236	00222311	21 April 2026	93.7	93.9
ACO-B37	ACO	6236	00192028	21 April 2026	93.8	93.9
ACO-B44	ACO	6236	00222302	21 April 2026	93.9	93.9
ACO-B45	ACO	6236	00222304	21 April 2026	93.9	93.9
ACO-B46	ACO	6236	00222305	21 April 2026	93.9	93.9
ACO-C1-B02	ACO	6238	00223039	21 April 2026	93.9	93.9
ACO-C1-B04	ACO	6238	00223041	21 April 2026	93.8	93.9
ACO-C1-B05	ACO	6238	00223042	21 April 2026	93.9	93.9
ST-C1-B06	SCARLET	ST-12D	10351461	21 April 2026	93.9	93.9
ST-C1-B07	SCARLET	ST-12D	10351464	21 April 2026	93.9	93.9
ST-C1-B08	SCARLET	ST-12D	10351469	21 April 2026	93.7	93.9
ST-C1-B09	SCARLET	ST-12D	10351478	21 April 2026	93.8	93.9
ST-C1-B10	SCARLET	ST-12D	10351483	21 April 2026	93.9	93.9
ST-C1-B11	SCARLET	ST-12D	10351484	21 April 2026	93.9	93.9
ST-C1-B12	SCARLET	ST-12D	10351485	21 April 2026	93.9	93.9
ST-C1-B13	SCARLET	ST-12D	10351486	21 April 2026	93.8	93.9
ST-C1-B14	SCARLET	ST-12D	10351488	21 April 2026	93.9	93.9
ST-C1-B15	SCARLET	ST-12D	10352314	21 April 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)				93.89 ± 0.10 dB		

Calibrated by : Adul Dangklom (Mr. Adul Dangklom)

Approved by : (Mr. Peera Detudom)

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

SP METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

ID LINE : IEC17025

ILAC-MRA ANAB ACCREDITED CALIBRATION AND DIMENSIONAL MEASUREMENT

Certificate of Calibration

Certificate Number : SPR25070021-1 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial Number : 222298
ID. Number : ACO-B04

Environmental Conditions
Ambient Temperature : 23 °C ± 3 °C
Relative Humidity : 50 % ± 15 %
Location of Calibration : In-Lab
Calibration Procedure : SP-CPE-04-01

Received Date : 01 Jul 2025
Calibration Date : 04 Jul 2025
Recommend Due Date : 04 Jul 2026
Date of Issue : 05 Jul 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.
The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Nanthawat Wanasit
Calibration Officer

Approved by :
(Mr.Pootthipong A.)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25070021-1

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR25070021-1

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR25070293-1 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	: Sound Level Meter		
Manufacturer	: ACO		
Model	: 6236		
Serial Number	: 222311		
ID. Number	: ACO-B05		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 15 Jul 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 18 Jul 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 18 Jul 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 19 Jul 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Nanthawat Wanasit
Calibration Officer

Approved by

(Mr.Poothipong A.)
Authorized Signatory

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25070293-1 Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th

Result of Calibration

Certificate Number : SPR25070293-1

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	111.7	111.7	-2.3	-2.3	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	111.8	111.8	-2.2	-2.2	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	111.8	111.8	-2.2	-2.2	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th

Certificate of Calibration

Certificate Number : SPR25070021-2

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	: Sound Level Meter		
Manufacturer	: ACO		
Model	: 6236		
Serial Number	: 192028		
ID. Number	: ACO-B37		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 01 Jul 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 04 Jul 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 04 Jul 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 05 Jul 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Nanthawat Wanasit
Calibration Officer

Approved by :
(Mr.Poothipong A.)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
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Calibration Report

Certificate Number : SPR25070021-2

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR25070021-2

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	114.0	114.0	0.0	0.0	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

SP METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.ลอนทียมเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR25070182-1

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial Number : 222302
ID. Number : ACO-B44

Environmental Conditions

Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 08 Jul 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 12 Jul 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 12 Jul 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 13 Jul 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Nanthawat Wanasit
Calibration Officer

Approved by :
(Mr.Prayoon Tepart)
Authorized Signatory

SP METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.ลอนทียมเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25070182-1

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR Thailand Institute of Scientific and Technological Research

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR25070182-1

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR25070021-3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	: Sound Level Meter		
Manufacturer	: ACO		
Model	: 6236		
Serial Number	: 222304		
ID. Number	: ACO-B45		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 01 Jul 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 04 Jul 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 04 Jul 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 05 Jul 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Nanthawat Wanasit
Calibration Officer

Approved by :
(Mr.Poothipong A.)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.ลอมเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25070021-3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR Thailand Institute of Scientific and Technological Research

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.ลอมเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR25070021-3

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Certificate of Calibration

Certificate Number : SPR25070182-2

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	:	Sound Level Meter		
Manufacturer	:	ACO		
Model	:	6236		
Serial Number	:	222305		
ID. Number	:	ACO-B46		

Environmental Conditions

Ambient Temperature	:	23 °C ± 3 °C	Received Date	:	08 Jul 2025
Relative Humidity	:	50 % ± 15 %	Calibration Date	:	12 Jul 2025
Location of Calibration	:	In-Lab	Recommend Due Date	:	12 Jul 2026
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	:	13 Jul 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Nanthawat Wanasit
Calibration Officer

Approved by :
(Mr.Prayoon Topart)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th

Result of Calibration

Certificate Number : SPR25070182-2

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

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Certificate of Calibration

Certificate Number : SPR25070021-4

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	: Sound Level Meter		
Manufacturer	: ACO		
Model	: 6238		
Serial Number	: 223039		
ID. Number	: ACO-C1-B02		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 01 Jul 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 04 Jul 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 04 Jul 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 05 Jul 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Nanthawat Wanasit
Calibration Officer

Approved by

(Mr.Poothipong A.)
Authorized Signatory

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METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25070021-4

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

TISTR - Thailand Institute of Scientific and Technological Research

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ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Result of Calibration

Certificate Number : SPR25070021-4

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

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Certificate of Calibration

Certificate Number : SPR25070021-5 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	:	Sound Level Meter		
Manufacturer	:	ACO		
Model	:	6238		
Serial Number	:	223041		
ID. Number	:	ACO-C1-B04		
Environmental Conditions				
Ambient Temperature	:	23 °C ± 3 °C	Received Date	: 01 Jul 2025
Relative Humidity	:	50 % ± 15 %	Calibration Date	: 04 Jul 2025
Location of Calibration	:	In-Lab	Recommend Due Date	: 04 Jul 2026
Calibration Procedure	:	SP-CPE-04-01	Date of Issue	: 05 Jul 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.
The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Nanthawat Wanasit
Calibration Officer

Approved by

(Mr.Poothipong A.)
Authorized Signatory

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :
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METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th

Result of Calibration

Certificate Number : SPR25070021-5 Page : 3 of 3

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Note:

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th

Certificate of Calibration

Certificate Number : SPR25060444-1 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	: Sound Level Meter		
Manufacturer	: ACO		
Model	: 6238		
Serial Number	: 223042		
ID. Number	: ACO-C1-B05		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 25 Jun 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 27 Jun 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 27 Jun 2026
Calibration Procedure	: SP-CPE-04-01	Date of Issue	: 28 Jun 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul
Calibration Officer

Approved by :
(Mr.Prayoon Tapard)
Authorized Signatory

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company
ID LINE : IEC17025
69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25060444-1

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP.22/0268	20 Feb 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

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Result of Calibration

Certificate Number : SPR25060444-1

Range : 94 to 114 dB Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.1	114.1	0.1	0.1	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Note :

The result of calibration was found accurate as show on date and place of calibration only. This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95%.

- End of Certificate -

SCARLET | TECH

Calibration Laboratory
3519

CERTIFICATE OF CALIBRATION

NO. 20250704103

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351461
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. 思達科技有限公司 SCARLET | TECH

Calibrated by:

I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass then, and applies only to the unit identified above.
II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80380

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.7	-14.3	0.0	1000	0.0	0.0	0.0
20	-50.4	-6.2	+0.1	2000	+1.1	-0.2	0.0
31.5	-39.5	-3.0	0.0	4000	+1.0	-0.8	0.0
63	-26.2	-0.8	0.0	8000	-1.1	-3.0	0.0
125	-16.2	-0.2	0.0	12500	-6.0	-7.9	-0.9
250	-8.7	0.0	+0.1	16000	-6.5	-8.5	0.0
500	-3.3	0.0	+0.1	20000	-9.3	-11.2	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.9 dB(A)	11.5 dB(C)	17.3 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	34.4
Rate of the S weighting decrease (dB/s)	3.4
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response (A Weighting):

Single Toneburst duration /ms	Toneburst response /dB			
	$L_{AFmax}-L_A$	$L_{ASmax}-L_A$	$L_{AE}-L_A$	$L_{Aeq1}-L_A$
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.1	-27.1	-27.2	-7.1
0.25	-27.1	/	-36.1	-7.0

10. Peak C sound level (500Hz):

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 °C

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

TAF Calibration Laboratory 3519

CERTIFICATE OF CALIBRATION

NO. 20250704106

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351464
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. SCARLET | TECH 斯卡科技有限公司

Calibrated by:

I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass then, and applies only to the unit identified above.
II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80364

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.7	-14.3	+0.1	1000	0.0	0.0	0.0
20	-50.4	-6.1	+0.1	2000	+1.1	-0.1	0.0
31.5	-39.4	-2.9	0.0	4000	+1.0	-0.8	0.0
63	-26.1	-0.8	0.0	8000	-1.1	-3.0	0.0
125	-16.2	-0.1	0.0	12500	-6.0	-7.9	-0.8
250	-8.7	0.0	+0.1	16000	-6.4	-8.4	0.0
500	-3.3	0.0	+0.1	20000	-9.3	-11.1	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.9 dB(A)	11.6 dB(C)	16.7 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	34.6
Rate of the S weighting decrease（dB/s）	3.4
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response（A Weighting）：

Single Toneburst duration /ms	Toneburst response /dB			
	L_{AFmax}-L_A	L_{ASmax}-L_A	L_{AE}-L_A	L_{Aeq}-L_A
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.1	-27.1	-27.2	-7.1
0.25	-27.2	/	-36.1	-7.0

10. Peak C sound level （500Hz）：

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.4	2.4

11. Overload indication： Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions：

Air temperature： 25 ℃

Relative humidity： 60 %

Static pressure： 102.0 kPa

References：

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

TAF
Calibration Laboratory
3519

CERTIFICATE OF CALIBRATION

NO. 20250704111

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351469
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. 聲佳科技有限公司

Calibrated by:

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II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80373

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.9	-14.2	+0.1	1000	0.0	0.0	0.0
20	-50.4	-6.2	+0.1	2000	+1.2	-0.1	0.0
31.5	-39.2	-3.0	0.0	4000	+1.0	-0.8	0.0
63	-26.3	-0.7	0.0	8000	-1.1	-2.9	0.0
125	-16.2	-0.1	0.0	12500	-6.0	-8.0	-0.8
250	-8.6	0.0	+0.1	16000	-6.5	-8.3	0.0
500	-3.3	0.0	+0.1	20000	-9.4	-11.1	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.8 dB(A)	10.6 dB(C)	16.7 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	34.6
Rate of the S weighting decrease (dB/s)	3.4
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response (A Weighting):

Single Toneburst duration /ms	Toneburst response /dB			
	$L_{AFmax}-L_A$	$L_{ASmax}-L_A$	$L_{AE}-L_A$	$L_{AeqT}-L_A$
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.1	-27.1	-27.2	-7.1
0.25	-27.2	/	-36.2	-7.0

10. Peak C sound level (500Hz):

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 °C

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

TAF Calibration Laboratory 3519

CERTIFICATE OF CALIBRATION

NO. 20250704120

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351478
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

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1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80435

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.9	-14.3	+0.1	1000	0.0	0.0	0.0
20	-50.4	-6.2	+0.1	2000	+1.1	-0.1	0.0
31.5	-39.1	-3.0	0.0	4000	+1.0	-0.8	0.0
63	-26.1	-0.7	0.0	8000	-1.0	-2.9	0.0
125	-16.1	-0.1	0.0	12500	-6.0	-8.0	-0.7
250	-8.7	0.0	+0.1	16000	-6.4	-8.4	0.0
500	-3.3	0.0	+0.1	20000	-9.3	-11.2	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.6 dB(A)	10.8 dB(C)	16.9 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	34.8
Rate of the S weighting decrease（dB/s）	3.5
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response（A Weighting）:

Single Toneburst duration /ms	Toneburst response /dB			
	L_{AFmax}-L_A	L_{ASmax}-L_A	L_{AE}-L_A	L_{Aeq}-L_A
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.2	-27.1	-27.1	-7.1
0.25	-27.2	/	-36.1	-7.0

10. Peak C sound level（500Hz）:

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 °C

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

TAF Calibration Laboratory 3519

CERTIFICATE OF CALIBRATION

NO. 20250704125

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351483
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. SCARLET | TECH 思锐科技有限公司

Calibrated by

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1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80424

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.8	-14.2	+0.1	1000	0.0	0.0	0.0
20	-50.3	-6.1	+0.1	2000	+1.1	-0.1	0.0
31.5	-39.3	-3.0	0.0	4000	+1.0	-0.8	0.0
63	-26.2	-0.7	0.0	8000	-1.0	-2.9	0.0
125	-16.2	-0.1	0.0	12500	-6.0	-8.0	-0.7
250	-8.8	0.0	+0.1	16000	-6.4	-8.3	0.0
500	-3.4	0.0	0.0	20000	-9.3	-11.1	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.8 dB(A)	10.8 dB(C)	17.9 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	34.7
Rate of the S weighting decrease (dB/s)	3.5
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response (A Weighting):

Single Toneburst duration /ms	Toneburst response /dB			
	$L_{AFmax}-L_A$	$L_{ASmax}-L_A$	$L_{AE}-L_A$	$L_{AeqT}-L_A$
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.1	-27.1	-27.1	-7.1
0.25	-27.1	/	-36.1	-7.0

10. Peak C sound level (500Hz):

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 °C

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

TAF Calibration Laboratory 3519

CERTIFICATE OF CALIBRATION

NO. 20250704126

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351484
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. 思碧科技有限公司

Calibrated by:

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1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80425

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.9	-14.2	+0.1	1000	0.0	0.0	0.0
20	-50.4	-6.2	+0.1	2000	+1.1	-0.1	0.0
31.5	-39.3	-3.0	0.0	4000	+1.0	-0.8	0.0
63	-26.1	-0.7	0.0	8000	-1.0	-2.9	0.0
125	-16.2	-0.1	0.0	12500	-6.0	-8.0	-0.7
250	-8.7	0.0	+0.1	16000	-6.4	-8.4	0.0
500	-3.4	0.0	0.0	20000	-9.3	-11.1	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.8 dB(A)	11.2 dB(C)	17.8 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	34.7
Rate of the S weighting decrease（dB/s）	3.6
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response（A Weighting）:

Single Toneburst duration /ms	Toneburst response /dB			
	L_{AFmax}-L_A	L_{ASmax}-L_A	L_{AE}-L_A	L_{Aeq}-L_A
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.1	-27.1	-27.1	-7.1
0.25	-27.2	/	-36.1	-7.0

10. Peak C sound level（500Hz）:

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 °C

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

TAF Calibration Laboratory 3519

CERTIFICATE OF CALIBRATION

NO. 20250704127

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351485
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. 思嘉科技有限公司

Calibrated by:

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1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80431

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.9	-14.2	+0.1	1000	0.0	0.0	0.0
20	-50.3	-6.2	+0.1	2000	+1.1	-0.1	0.0
31.5	-39.3	-3.0	0.0	4000	+1.0	-0.8	0.0
63	-26.2	-0.7	0.0	8000	-1.0	-2.9	0.0
125	-16.2	-0.1	0.0	12500	-6.0	-8.0	-0.7
250	-8.7	0.0	+0.1	16000	-6.4	-8.4	0.0
500	-3.4	0.0	0.0	20000	-9.4	-11.2	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.7 dB(A)	11.0 dB(C)	16.0 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	34.7
Rate of the S weighting decrease（dB/s）	3.5
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response（A Weighting）:

Single Toneburst duration /ms	Toneburst response /dB			
	$L_{AFmax}-L_A$	$L_{ASmax}-L_A$	$L_{AE}-L_A$	$L_{AeqT}-L_A$
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.1	-27.1	-27.1	-7.1
0.25	-27.1	/	-36.1	-7.0

10. Peak C sound level （500Hz）:

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 ℃

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

TAF Calibration Laboratory 3519

CERTIFICATE OF CALIBRATION

NO. 20250704128

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351486
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. SCARLET | TECH 思嘉科技有限公司

Calibrated by:

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II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80429

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.9	-14.2	+0.1	1000	0.0	0.0	0.0
20	-50.3	-6.2	+0.1	2000	+1.1	-0.1	0.0
31.5	-39.3	-3.0	0.0	4000	+1.0	-0.8	0.0
63	-26.2	-0.7	0.0	8000	-1.0	-2.9	0.0
125	-16.2	-0.1	0.0	12500	-6.0	-8.0	-0.7
250	-8.7	0.0	+0.1	16000	-6.4	-8.4	0.0
500	-3.4	0.0	0.0	20000	-9.4	-11.2	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.6 dB(A)	10.7 dB(C)	17.2 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	34.7
Rate of the S weighting decrease（dB/s）	3.4
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response（A Weighting）:

Single Toneburst duration /ms	Toneburst response /dB			
	L_{AFmax}-L_A	L_{ASmax}-L_A	L_{AE}-L_A	L_{Aeq}-L_A
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.1	-27.2	-27.1	-7.1
0.25	-27.1	/	-36.1	-7.0

10. Peak C sound level（500Hz）:

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 ℃

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

Calibration Laboratory
3519

CERTIFICATE OF CALIBRATION

NO. 20250704130

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10351488
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. 斯卡雷科技有限公司

Calibrated by:

I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass then, and applies only to the unit identified above.
II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80393

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.8	-14.3	+0.1	1000	0.0	0.0	0.0
20	-50.3	-6.2	+0.1	2000	+1.1	-0.1	0.0
31.5	-39.3	-3.0	0.0	4000	+1.0	-0.7	0.0
63	-26.2	-0.7	0.0	8000	-1.0	-2.9	0.0
125	-16.2	-0.1	0.0	12500	-6.0	-8.0	-0.7
250	-8.7	0.0	+0.1	16000	-6.4	-8.4	0.0
500	-3.3	0.0	0.0	20000	-9.3	-11.3	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.7 dB(A)	10.8 dB(C)	17.6 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	34.6
Rate of the S weighting decrease (dB/s)	3.4
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response (A Weighting):

Single Toneburst duration /ms	Toneburst response /dB			
	$L_{AFmax}-L_A$	$L_{ASmax}-L_A$	$L_{AE}-L_A$	$L_{AeqT}-L_A$
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.1	-27.1	-27.1	-7.1
0.25	-27.2	/	-36.1	-7.0

10. Peak C sound level (500Hz):

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 °C

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

SCARLET | TECH

TAF Calibration Laboratory 3519

CERTIFICATE OF CALIBRATION

NO. 20250704102

Name of Product:	Sound Level Meter
Model:	ST-12D
Serial Number:	10352314
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2025-09-05
Due Date:	2026-09-04

SCARLET TECH CO., LTD. SCARLET | TECH 思卡科技有限公司

Calibrated by:

I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass then, and applies only to the unit identified above.

II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.

III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-80374

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-69.9	-14.4	+0.1	1000	0.0	0.0	0.0
20	-50.4	-6.2	+0.1	2000	+1.1	-0.2	0.0
31.5	-39.4	-2.9	+0.1	4000	+1.0	-0.8	0.0
63	-26.1	-0.8	0.0	8000	-1.1	-3.0	0.0
125	-16.2	-0.2	0.0	12500	-6.0	-7.9	-0.9
250	-8.8	0.0	0.0	16000	-6.5	-8.5	0.0
500	-3.3	0.0	+0.1	20000	-9.4	-11.2	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

10.9 dB(A)	11.3 dB(C)	16.2 dB(Z)

7. F&S Weighting

Rate of the F weighting decrease（dB/s）	34.3
Rate of the S weighting decrease（dB/s）	3.4
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.2 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.2 dB

9. Tone burst response（A Weighting）:

Single Toneburst duration /ms	Toneburst response /dB			
	L_{AFmax}-L_A	L_{ASmax}-L_A	L_{AE}-L_A	L_{AeqT}-L_A
500	-0.1	-4.1	-3.0	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.2	-27.1	-27.2	-7.1
0.25	-27.1	/	-36.3	-7.0

10. Peak C sound level（500Hz）:

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.1	0.1
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.9	0.0
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

13. Part of sound exposure: Pass

14. Data logging function: Pass

15. TF card & wave recording function: Pass

Environment conditions:

Air temperature: 25 °C

Relative humidity: 60 %

Static pressure: 102.0 kPa

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0514 **MTC No.** EEL. BP. 34/0868

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co.,Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Road, Jompol, Chatuchak, Bangkok 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator
Manufacturer : SVANTEK
Model : SV34
Serial No. : 83820

Ambient Environment

Temperature : (23 ± 3) °C
Relative Humidity : (50 ± 15) %
Ambient Pressure : (101.325 ± 1.500) kPa

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 14 Aug. 2025

Date of Calibration : 22 Aug. 2025

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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NSC-TISI-TIS 17025
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0514 **MTC No.** EEL. BP. 34/0868

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 114 dB re 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	114.02	0.02	± 0.10	±0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	± 1.5	±2.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	0.21	± 0.50	±4.0%

Note : 1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was not included.

Calibrated by : .....
(Mr.Weerachai Deechaiyae)

Approved by : .....
(Mr.Prawate Kluaypa)
Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 22 Aug. 2025

Date of Issue : 25 Aug. 2025

Ref : 2011268081403169011

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
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บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Noise Dose B_171_2/26

Noise Dose Meter Calibration Report

Acoustic Calibrator Data			
Brand	SVANTEK	Number	SV 03/60
Model	SV34	Serial No.	83820
Calibration Range	114 dB, 1000 Hz	Last Calibration	22 August 2025
		Due Date	22 August 2026

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-B07	SVANTEK	SV-104IS	80817	21 April 2026	113.9	114.0
NMD-B08	SVANTEK	SV-104IS	80818	21 April 2026	114.0	114.0
NMD-B09	SVANTEK	SV-104IS	80829	21 April 2026	114.0	114.0
NMD-B10	SVANTEK	SV-104IS	80830	21 April 2026	113.9	114.0
NMD-B11	SVANTEK	SV-104IS	80831	21 April 2026	114.0	114.0
NMD-B12	SVANTEK	SV-104IS	80832	21 April 2026	114.1	114.0
NMD-B13	SVANTEK	SV-104IS	80834	21 April 2026	114.0	114.0
NMD-B14	SVANTEK	SV-104IS	80875	21 April 2026	114.0	114.0
NMD-B15	SVANTEK	SV-104IS	80880	21 April 2026	114.0	114.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					114.02± 0.10 dB	

Calibrated by : Adul Dangklom
(Mr. Adul Dangklom)

Approved by :
(Mr. Peera Detudom)

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0514 **MTC No.** EEL. BP. 28/0868

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.
Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :
Description : Noise Dosimeter
Manufacturer : Svantek
Model : SV-104IS
Serial No. : 80817

Ambient Environment
Temperature : (23 ± 3) °C
Relative Humidity : (50 ± 15) %
Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :
Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :
This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 14 Aug. 2025
Date of Calibration : 21 Aug. 2025

1 / 2

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(66) 08 3219 9440
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(66) 08 1889 6827

Request No. 21-68/0514 **MTC No.** EEL. BP. 28/0868

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve A-weighting (dB)	Deviation from response curve C-weighting (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
125	0.4	-0.1	0.25	2.0
1 000	-0.1	-0.1	0.25	1.4
4 000	-1.7	-1.6	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by : .....

(Mr. Sanaey Grajang)

Approved by : .....

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 20112680814031690O5

Date of Calibration : 21 Aug. 2025

Date of Issue : 22 Aug. 2025

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0439 **MTC No.** EEL. BP. 55/0668

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Svantek

Model : SV-104IS

Serial No. : 80818

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 25 Jun. 2025

Date of Calibration : 30 Jun. 2025

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

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Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827

Request No. 21-68/0439 **MTC No.** EEL. BP. 55/0668

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve A-weighting (dB)	Deviation from response curve C-weighting (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
125	0.5	0.1	0.25	2.0
1 000	0.0	-0.1	0.25	1.4
4 000	-0.4	-0.3	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

(Mr. Sanaey Grajang)

Approved by :

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 20112680625024340O1

Date of Calibration : 30 Jun. 2025

Date of Issue : 2 Jul. 2025

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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E-mail : mtc@tistr.or.th Website : www.tistr.or.th

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0439 **MTC No.** EEL. BP. 56/0668

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Svantek

Model : SV-104IS

Serial No. : 80829

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 25 Jun. 2025

Date of Calibration : 30 Jun. 2025

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

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(66) 08 3219 9440
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(66) 08 1889 6827

Request No. 21-68/0439 **MTC No.** EEL. BP. 56/0668

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve A-weighting (dB)	Deviation from response curve C-weighting (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
125	0.3	0.2	0.25	2.0
1 000	-0.1	-0.1	0.25	1.4
4 000	-0.4	-0.3	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

.....

(Mr. Sanaey Grajang)

Approved by :

.....

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 20112680625024340O2

Date of Calibration : 30 Jun. 2025

Date of Issue : 2 Jul. 2025

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0439 **MTC No.** EEL. BP. 57/0668

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Svantek

Model : SV-104IS

Serial No. : 80830

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 25 Jun. 2025

Date of Calibration : 30 Jun. 2025

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

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Request No. 21-68/0439 **MTC No.** EEL. BP. 57/0668

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve A-weighting (dB)	Deviation from response curve C-weighting (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
125	0.1	-0.3	0.25	2.0
1 000	0.0	-0.1	0.25	1.4
4 000	-0.4	-0.4	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

(Mr. Sanaey Grajang)

Approved by :

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 20112680625024340O3

Date of Calibration : 30 Jun. 2025

Date of Issue : 2 Jul. 2025

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827

Request No. 21-68/0600 **MTC No.** EEL. BP. 69/0968

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Svantek

Model : SV-104IS

Serial No. : 80831

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 + 1.5) kPa

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 25 Sep. 2025

Date of Calibration : 6 Oct. 2025

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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Request No. 21-68/0600 **MTC No.** EEL. BP. 69/0968

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty	Tolerance Limits
	A-weighting (dB)	C-weighting (dB)	(±dB)	Class 2 (±dB)
125	-0.2	-0.4	0.25	2.0
1 000	-0.4	-0.5	0.25	1.4
4 000	-1.5	-1.5	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

.....

(Mr. Sanaey Grajang)

Approved by :

.....

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 20112680925038080001

Date of Calibration : 6 Oct. 2025

Date of Issue : 8 Oct. 2025

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0003 **MTC No.** EEL. BP. 7/1068

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Svantek

Model : SV-104IS

Serial No. : 80832

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 + 1.5) kPa

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 1 Oct. 2025

Date of Calibration : 6 Oct. 2025

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

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(66) 08 1889 6827

Request No. 21-69/0003 **MTC No.** EEL. BP. 7/1068

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)		
125	0.0	-0.1	0.25	2.0
1 000	0.3	-0.1	0.25	1.4
4 000	-0.2	-0.1	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by : .....

(Mr. Sanaey Grajang)

Approved by : .....

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 20112681001038730O1

Date of Calibration : 6 Oct. 2025

Date of Issue : 8 Oct. 2025

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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(66) 08 1889 6827

Request No. 21-69/0003 **MTC No.** EEL. BP. 8/1068

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Svantek

Model : SV-104IS

Serial No. : 80834

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 1 Oct. 2025

Date of Calibration : 6 Oct. 2025

The results relate only to the items tested/calibrated or value assigned.
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(66) 08 1889 6827

Request No. 21-69/0003 **MTC No.** EEL. BP. 8/1068

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty	Tolerance Limits
	A-weighting (dB)	C-weighting (dB)	(±dB)	Class 2 (±dB)
125	-0.1	-0.1	0.25	2.0
1 000	0.4	0.0	0.25	1.4
4 000	0.2	0.5	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by : .....

(Mr. Sanaey Grajang)

Approved by : .....

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 20112681001038730O2

Date of Calibration : 6 Oct. 2025

Date of Issue : 8 Oct. 2025

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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Request No. 21-69/0003 **MTC No.** EEL. BP. 9/1068

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Svantek

Model : SV-104IS

Serial No. : 80875

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 1 Oct. 2025

Date of Calibration : 6 Oct. 2025

The results relate only to the items tested/calibrated or value assigned.
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Request No. 21-69/0003 **MTC No.** EEL. BP. 9/1068

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve A-weighting (dB)	Deviation from response curve C-weighting (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
125	-0.2	-0.3	0.25	2.0
1 000	-0.3	-0.4	0.25	1.4
4 000	-0.4	-0.2	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

.....

(Mr. Sanaey Grajang)

Approved by :

.....

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 20112681001038730003

Date of Calibration : 6 Oct. 2025

Date of Issue : 8 Oct. 2025

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0003 **MTC No.** EEL. BP. 10/1068

CALIBRATION CERTIFICATE

Submitted by : S.P.S.Consulting Service Co., Ltd.

Address : 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok, 10900.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre. Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Svantek

Model : SV-104IS

Serial No. : 80880

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards mantained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Date of Receipt : 1 Oct. 2025

Date of Calibration : 6 Oct. 2025

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

Head Office
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand
Tel. (66) 0 2577 9036
Fax. (66) 0 2577 9009

Office/Laboratory
668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office
196 Phahonyothin Road, Ladyao, Chatuchak,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0003 **MTC No.** EEL. BP. 10/1068

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)		
125	-0.5	-0.6	0.25	2.0
1 000	0.1	0.0	0.25	1.4
4 000	-0.2	-0.1	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by : G.Sanay

(Mr. Sanaey Grajang)

Approved by : Prawat Kluaypa

(Mr. Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011268100103873004

Date of Calibration : 6 Oct. 2025

Date of Issue : 8 Oct. 2025

End of Certificate

The results relate only to the items tested/calibrated or value assigned.
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

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(66) 08 1889 6827

Certificate of Calibration

Certificate Number : SPR25080318-3 Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name : Light Meter
Manufacturer : Extech
Model : 407026
Serial Number : A.052151
ID. Number : LUX-B07

Environmental Conditions

Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 19 Aug 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 22 Aug 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 22 Aug 2026
Calibration Procedure	: SP-CPE-04-32	Date of Issue	: 23 Aug 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.
The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul
Calibration Officer

Approved by

(Mr.Poothipong A.)
Authorized Signatory

SPM A Trescal SP Metrology System (Thailand) Co., Ltd.

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Calibration Report

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Digital Light Meter	LX-73	Q842777	24PH432	21 Aug 2026

Traceability

This certification is traceable to the International System of Unit maintained at :
TPA - Technology Promotion Association (Thailand-Japan)

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Result of Calibration

Certificate Number : SPR25080318-3

Function: Illumination Measurement

Unit : Lux

Calibration Point	Standard Reading	UUC Reading	Error	Uncertainty (±)
100	100.0	100	0	1.7
200	200	200	0	6.6
300	300	298	2	6.6
1000	1000	988	-12	13
2000	2000	1982	-18	26
3000	3000	2970	-30	39

Note :

The result of calibration was found accurate as show on date and place of calibration only.
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95 %

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Certificate of Calibration

Certificate Number : SPR25080318-4

Customer : S.P.S. CONSULTING SERVICE CO., LTD.
7 Soi Phaholyothin 24 Phaholyothin Road., Jompol, Chatuchak, Bangkok 10900

Equipment Name	: Light Meter		
Manufacturer	: Extech		
Model	: 407026		
Serial Number	: A.052156		
ID. Number	: B08		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 3 °C	Received Date	: 19 Aug 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 27 Aug 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 27 Aug 2026
Calibration Procedure	: SP-CPE-04-32	Date of Issue	: 28 Aug 2025

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received.Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.
The calibration certificate shall not be reproduced except in full,without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul
Calibration Officer

Approved by
(Mr.Peetthipong A.)
Authorized Signatory

SPM A Trescal SP Metrology System (Thailand) Co.,Ltd

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

Calibration Report

Certificate Number : SPR25080318-4

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Digital Light Meter	LX-73	Q842777	24PH432	21 Aug 2026

Traceability

This certification is traceable to the International System of Unit maintained at :

TPA - Technology Promotion Association (Thailand-Japan)

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

METROLOGY SYSTEM (THAILAND) CO.,LTD.
A Trescal company

Result of Calibration

Certificate Number : SPR25080318-4

Function: Illumination Measurement

Unit : Lux

Calibration Point	Standard Reading	UUC Reading	Error	Uncertainty (±)
100	100.0	100	0	1.7
200	200	200	0	6.6
300	300	299	-1	6.6
1000	1000	990	-10	13
2000	2000	1982	-18	26
3000	3000	2970	-30	39

Note :

The result of calibration was found accurate as show on date and place of calibration only.

This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor k = 2.00, providing a level of confidence approximately 95 %

- End of Certificate -

69/29 Moo 1 Klongsi Klongluang Pathumthani 12120 Tel: (662) 193-2217-20 www.spmetrology.co.th www.สอบเทียบเครื่องมือวัด.com

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com.. www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter	Model : Defender 510-H	S/N : 136164

Calibration Data												
Rotameter Data			Calibration Data									
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve		
				Flow Rate (Reading)			Actual (Q std.)					
				1	2	3	1	2	3	y	R^2	
H-B01	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	500.8	997.7	1994.6	0.997x + 1.368	1.000	
H-B02	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	500.9	997.0	1994.3	0.998x + 0.689	1.000	
H-B03	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	499.5	999.8	1997.2	0.999x - 0.227	1.000	
H-B04	Dwyer	VFB-65	02/04/2026	500	1,000	2,000	499.4	1000.9	2000.3	1.000x - 1.929	0.999	
H-B05	Dwyer	VFB-65	02/04/2026	500	1,000	2,000	499.0	999.6	1998.7	1.001x + 0.053	1.000	
H-B06	Dwyer	VFB-65	02/04/2026	500	1,000	2,000	499.8	998.0	1996.5	0.998x + 0.698	1.000	
H-B07	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	500.1	1000.8	1996.2	0.999x + 2.423	0.999	
H-B08	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	499.8	1000.1	1997.6	0.999x - 0.675	1.000	
H-B09	Dwyer	VFB-65	06/04/2026	500	1,000	2,000	499.6	1002.1	2002.4	1.001x - 6.068	0.999	
H-B10	Dwyer	VFB-65	06/04/2026	500	1,000	2,000	500.4	1001.6	1999.6	0.999x + 1.475	1.000	

Calibrated by :	Approved by :
Adul Dangklom (Mr.Adul Dangklom)	(Mr. Peera Detudom)

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Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com.. www.spscon.com

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter	Model : Defender 510-H	S/N : 136164

Calibration Data												
Rotameter Data			Calibration Data									
No.	Brand	Model	Date	Flow Rate (ml/min)						Value From Calibration Curve		
				Flow Rate (Reading)			Actual (Q std.)					
				1	2	3	1	2	3	y	R^2	
L-B01	Dwyer	VFA-21	01/04/2026	50	100	200	49.8	100.6	200.9	1.001x + 0.276	1.000	
L-B02	Dwyer	VFA-21	01/04/2026	50	100	200	50.7	101.9	201.6	1.000x + 1.270	1.000	
L-B03	Dwyer	VFA-21	01/04/2026	50	100	200	50.3	99.8	199.2	1.001x - 0.849	0.999	
L-B04	Dwyer	VFA-21	02/04/2026	50	100	200	49.9	98.6	202.5	1.002x - 0.797	0.999	
L-B05	Dwyer	VFA-21	02/04/2026	50	100	200	50.8	99.7	201.4	0.999x + 0.452	1.000	
L-B06	Dwyer	VFA-21	02/04/2026	50	100	200	50.7	101.9	199.3	1.000x + 0.872	1.000	
L-B07	Dwyer	VFA-21	01/04/2026	50	100	200	50.8	99.1	202.9	0.999x + 0.048	0.999	
L-B08	Dwyer	VFA-21	01/04/2026	50	100	200	50.6	100.1	198.7	0.997x + 0.447	1.000	
L-B09	Dwyer	VFA-21	06/04/2026	50	100	200	50.2	100.8	200.7	1.000x + 0.515	1.000	
L-B10	Dwyer	VFA-21	06/04/2026	50	100	200	50.1	99.5	201.1	1.001x - 0.608	0.999	

Calibrated by :	Approved by :
Adul Dangklom (Mr.Adul Dangklom)	(Mr. Peera Detudom)

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Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com.. www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter | Model : Defender 510-H | S/N : 136164

Environmental Conditions

Temperature	.	25	± 3	°C
Pressure	.	1010	± 15	mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R^2
B01	SKC	224-PCXR4	262101	01/04/2026	1,000	1,500	2,000	1,002	1,503	2,004	1.002x - 1.364	1.000
B02	SKC	224-PCXR4	626166	01/04/2026	1,000	1,500	2,000	1,004	1,501	2,003	1.001x - 0.594	1.000
B03	SKC	224-PCXR4	612968	01/04/2026	1,000	1,500	2,000	1,003	1,502	1,994	1.003x - 9.098	0.999
B04	SKC	224-PCXR4	602804	01/04/2026	1,000	1,500	2,000	1,000	1,502	1,998	0.998x + 0.642	1.000
B05	SKC	224-PCXR4	612693	01/04/2026	1,000	1,500	2,000	1,001	1,504	1,999	1.000x - 1.767	1.000
B06	SKC	224-PCXR4	262188	01/04/2026	1,000	1,500	2,000	999	1,500	2,002	1.001x - 3.590	1.000
B07	SKC	224-PCXR4	626262	01/04/2026	1,000	1,500	2,000	997	1,506	2,003	1.004x - 9.859	0.999
B08	SKC	224-PCXR4	626100	01/04/2026	1,000	1,500	2,000	1,003	1,503	2,005	1.003x - 4.160	1.000
B09	SKC	224-PCXR4	626479	01/04/2026	1,000	1,500	2,000	998	1,497	1,997	1.000x - 3.382	1.000
B10	SKC	224-PCXR4	091950	01/04/2026	1,000	1,500	2,000	1,004	1,506	1,996	1.003x - 7.323	0.999
B11	SKC	224-PCXR8	564315	01/04/2026	1,000	1,500	2,000	1,000	1,493	2,003	1.005x - 10.601	1.000
B12	SKC	224-PCXR4	034656	01/04/2026	1,000	1,500	2,000	997	1,495	1,997	0.998x - 1.755	1.000
B13	SKC	224-PCXR4	602073	01/04/2026	1,000	1,500	2,000	1,001	1,501	1,986	0.996x + 2.864	0.999
B14	SKC	224-PCXR4	626313	01/04/2026	1,000	1,500	2,000	999	1,494	1,997	0.999x - 1.898	0.999
B15	SKC	224-PCXR4	626474	01/04/2026	1,000	1,500	2,000	996	1,498	1,993	1.007x - 17.126	0.999
B16	SKC	224-PCXR4	626477	01/04/2026	1,000	1,500	2,000	1,002	1,499	1,997	0.997x + 1.352	1.000
B17	SKC	224-PCXR4	626860	01/04/2026	1,000	1,500	2,000	996	1,510	1,999	1.005x - 12.252	0.999
B18	SKC	224-PCXR4	691484	01/04/2026	1,000	1,500	2,000	995	1,499	1,997	1.006x - 12.384	1.000
B19	SKC	224-PCXR4	691599	01/04/2026	1,000	1,500	2,000	998	1,501	1,991	1.004x - 10.506	0.999
B20	SKC	224-PCXR4	691587	01/04/2026	1,000	1,500	2,000	997	1,495	1,998	1.003x - 7.247	1.000
B21	SKC	224-PCXR4	691531	03/04/2026	1,000	1,500	2,000	998	1,496	1,996	1.000x - 3.454	1.000
B22	SKC	224-PCXR4	691634	03/04/2026	1,000	1,500	2,000	996	1,494	1,997	0.998x - 2.784	1.000
B23	SKC	224-PCXR4	798393	02/04/2026	1,000	1,500	2,000	1,000	1,503	1,999	0.999x - 1.308	1.000
B24	SKC	224-PCXR4	626363	03/04/2026	1,000	1,500	2,000	1,001	1,509	1,995	1.002x - 6.940	0.999
B25	SKC	224-PCXR4	798489	03/04/2026	1,000	1,500	2,000	1,002	1,502	2,004	1.004x - 7.267	1.000
B26	SKC	224-PCXR4	798479	03/04/2026	1,000	1,500	2,000	996	1,503	2,003	1.006x - 12.675	1.000
B27	SKC	224-PCXR4	691673	02/04/2026	1,000	1,500	2,000	1,000	1,504	2,000	0.999x + 0.483	1.000
B28	SKC	224-PCXR4	691570	03/04/2026	1,000	1,500	2,000	997	1,510	2,001	0.998x - 0.455	0.999
B29	SKC	224-PCXR4	626472	03/04/2026	1,000	1,500	2,000	998	1,494	1,992	1.000x - 5.221	1.000
B30	SKC	224-PCXR4	691489	03/04/2026	1,000	1,500	2,000	1,008	1,504	2,006	1.003x - 2.114	1.000
B31	SKC	224-PCXR4	691509	03/04/2026	1,000	1,500	2,000	1,003	1,503	2,002	0.997x + 0.610	0.999
B32	SKC	224-PCXR4	091567	03/04/2026	1,000	1,500	2,000	1,002	1,502	1,996	0.996x + 7.008	1.000
B33	SKC	224-PCXR4	091756	03/04/2026	1,000	1,500	2,000	998	1,501	1,992	1.006x - 12.101	0.999
B34	SKC	224-PCXR4	612962	03/04/2026	1,000	1,500	2,000	1,001	1,494	2,004	1.004x - 8.196	1.000
B35	SKC	224-PCXR4	602682	03/04/2026	1,000	1,500	2,000	997	1,504	1,998	1.000x - 2.804	1.000
B36	SKC	224-PCXR4	626164	03/04/2026	1,000	1,500	2,000	996	1,512	1,996	1.001x - 5.867	0.999
B37	SKC	224-PCXR4	626256	03/04/2026	1,000	1,500	2,000	999	1,496	2,005	1.007x - 11.487	1.000
B38	SKC	224-PCXR4	626167	03/04/2026	1,000	1,500	2,000	1,002	1,500	2,003	1.008x - 16.377	0.999
B39	SKC	224-PCXR4	034637	03/04/2026	1,000	1,500	2,000	998	1,490	1,994	0.996x - 0.044	1.000
B40	SKC	224-PCXR4	798349	03/04/2026	1,000	1,500	2,000	1,001	1,501	2,000	0.995x + 0.921	0.999

Calibrated by : Adul Dangklom (Mr. Adul Dangklom)

Approved by : (Mr. Peera Detudom)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
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Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com.. www.spscon.com

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter | Model : Defender 510-H | S/N : 136164

Environmental Conditions

Temperature	.	25	± 3	°C
Pressure	.	1010	± 15	mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R^2
B41	SKC	224-PCXR4	612669	03/04/2026	1,000	1,500	2,000	996	1,498	1,991	1.006x - 15.132	0.999
B42	SKC	224-PCXR4	626041	03/04/2026	1,000	1,500	2,000	998	1,495	1,998	1.001x - 5.029	1.000
B43	SKC	224-PCXR4	034636	03/04/2026	1,000	1,500	2,000	996	1,512	1,995	1.000x - 4.272	0.999
B44	SKC	224-PCXR8	529941	03/04/2026	1,000	1,500	2,000	1,000	1,501	2,000	0.999x + 0.802	1.000
B45	SKC	224-PCXR8	529594	03/04/2026	1,000	1,500	2,000	996	1,495	1,999	1.003x - 8.918	1.000
B46	SKC	224-PCXR8	566743	03/04/2026	1,000	1,500	2,000	998	1,501	1,992	1.006x - 12.300	0.999
B47	SKC	224-PCXR8	566747	03/04/2026	1,000	1,500	2,000	996	1,505	2,000	1.004x - 8.392	1.000
B48	SKC	224-PCXR8	566753	03/04/2026	1,000	1,500	2,000	1,011	1,508	2,008	0.998x + 4.726	0.999
B49	SKC	224-PCXR8	566780	03/04/2026	1,000	1,500	2,000	997	1,495	1,999	1.003x - 8.045	1.000
B50	SKC	224-PCXR8	500400	03/04/2026	1,000	1,500	2,000	1,000	1,499	1,994	0.996x + 3.406	1.000
B51	SKC	224-PCXR8	500363	03/04/2026	1,000	1,500	2,000	997	1,505	1,997	1.005x - 14.055	0.999
B52	SKC	224-PCXR8	093186	03/04/2026	1,000	1,500	2,000	996	1,506	2,000	1.002x - 5.484	1.000
B53	SKC	224-PCXR8	707670	03/04/2026	1,000	1,500	2,000	993	1,505	2,001	1.009x - 20.477	0.999
B54	SKC	224-PCXR3	509821	06/04/2026	1,000	1,500	2,000	1,005	1,500	2,008	1.007x - 10.015	1.000
B55	SKC	224-PCXR3	510710	06/04/2026	1,000	1,500	2,000	1,013	1,502	2,007	1.002x - 2.573	0.999
B56	SKC	224-PCXR3	511450	06/04/2026	1,000	1,500	2,000	992	1,492	1,999	1.004x - 10.669	1.000
B57	SKC	224-PCXR3	510798	06/04/2026	1,000	1,500	2,000	999	1,496	1,996	0.998x - 0.463	1.000
B58	SKC	224-PCXR3	509852	06/04/2026	1,000	1,500	2,000	1,003	1,499	1,999	0.996x + 4.204	1.000
B59	SKC	224-PCXR3	509862	06/04/2026	1,000	1,500	2,000	1,000	1,500	1,998	0.998x + 0.850	1.000
B60	SKC	224-PCXR3	512655	06/04/2026	1,000	1,500	2,000	997	1,506	2,002	1.003x - 8.264	0.999
B61	SKC	224-PCXR3	503915	06/04/2026	1,000	1,500	2,000	999	1,505	2,006	1.004x - 6.792	1.000
B62	SKC	224-PCXR3	503973	06/04/2026	1,000	1,500	2,000	998	1,504	2,004	1.005x - 10.095	1.000
B63	SKC	224-PCXR3	511432	09/04/2026	1,000	1,500	2,000	999	1,500	1,997	0.999x - 2.345	1.000
B64	SKC	224-PCXR3	508302	09/04/2026	1,000	1,500	2,000	1,001	1,491	1,996	0.997x + 0.511	1.000
B65	SKC	224-PCXR3	508310	09/04/2026	1,000	1,500	2,000	1,002	1,509	1,994	1.000x - 4.906	0.999
B66	SKC	224-PCXR3	509861	09/04/2026	1,000	1,500	2,000	995	1,501	2,004	1.008x - 15.001	1.000
B67	SKC	224-PCXR3	506295	09/04/2026	1,000	1,500	2,000	1,002	1,500	1,999	0.998x + 1.468	1.000
B68	SKC	224-PCXR3	505872	09/04/2026	1,000	1,500	2,000	1,005	1,494	1,994	0.996x - 1.783	0.999
B69	SKC	224-PCXR3	508375	09/04/2026	1,000	1,500	2,000	997	1,505	2,005	1.009x - 17.840	0.999
B70	SKC	224-PCXR3	510623	09/04/2026	1,000	1,500	2,000	998	1,499	1,999	1.000x - 2.573	1.000
B71	SKC	224-PCXR3	508367	09/04/2026	1,000	1,500	2,000	1,002	1,503	1,989	0.997x - 0.594	0.999
B72	SKC	224-PCXR3	505977	09/04/2026	1,000	1,500	2,000	999	1,504	2,001	1.002x - 4.551	1.000
B73	SKC	224-PCXR3	512606	09/04/2026	1,000	1,500	2,000	1,001	1,502	2,002	1.000x - 1.555	1.000
B74	SKC	224-PCXR3	505993	09/04/2026	1,000	1,500	2,000	1,003	1,504	2,008	1.006x - 6.832	1.000
B75	SKC	224-PCXR3	509820	09/04/2026	1,000	1,500	2,000	1,002	1,503	1,990	1.002x - 9.465	0.999
B76	SKC	224-PCXR3	509811	09/04/2026	1,000	1,500	2,000	1,001	1,500	2,002	1.001x - 2.688	1.000
B77	SKC	224-PCXR3	508301	09/04/2026	1,000	1,500	2,000	999	1,501	1,996	0.998x + 0.550	1.000
B78	SKC	224-PCXR3	510677	09/04/2026	1,000	1,500	2,000	1,000	1,496	1,997	1.000x - 3.151	1.000
B79	SKC	224-PCXR3	510920	09/04/2026	1,000	1,500	2,000	1,002	1,502	1,986	0.997x - 2.026	0.999

Calibrated by : Adul Dangklom (Mr. Adul Dangklom)

Approved by : (Mr. Peera Detudom)

บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter	Model : Defender 510-H	S/N : 136164

Environmental Conditions

Temperature . 25 ± 3 °C
Pressure . 1010 ± 15 mmbar

Personal Pump Data					Calibration Data							
					Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
No.	Brand	Model	Serial No.	Date	1	2	3	1	2	3	y	R^2
B80	SKC	224-PCXR3	504569	01/04/2026	1,000	1,500	2,000	1,002	1,500	2,002	0.999x - 1.161	1.000
B81	SKC	224-PCXR3	503480	01/04/2026	1,000	1,500	2,000	993	1,497	1,991	0.997x - 0.040	1.000
B82	SKC	224-PCXR3	505673	01/04/2026	1,000	1,500	2,000	1,001	1,501	1,986	0.996x + 2.864	0.999
B83	SKC	224-PCXR3	510783	01/04/2026	1,000	1,500	2,000	1,009	1,500	1,993	0.994x + 0.437	0.999
B84	SKC	224-PCXR3	508333	03/04/2026	1,000	1,500	2,000	1,003	1,502	1,990	0.999x - 3.542	0.999
B85	SKC	224-PCXR3	505757	01/04/2026	1,000	1,500	2,000	1,004	1,499	2,001	0.996x + 5.197	1.000
B86	SKC	224-PCXR3	512625	01/04/2026	1,000	1,500	2,000	1,001	1,502	1,997	0.997x + 1.603	1.000
B87	SKC	224-PCXR3	504324	01/04/2026	1,000	1,500	2,000	1,002	1,492	2,001	0.999x - 1.855	1.000
B88	SKC	224-PCXR3	508307	03/04/2026	1,000	1,500	2,000	1,011	1,501	2,003	0.997x + 4.084	0.999
B89	SKC	224-PCXR3	509860	03/04/2026	1,000	1,500	2,000	999	1,502	1,991	1.005x - 10.506	0.999
B90	SKC	224-PCXR3	508366	01/04/2026	1,000	1,500	2,000	998	1,500	2,002	1.003x - 5.376	1.000
B91	SKC	224-PCXR3	510919	01/04/2026	1,000	1,500	2,000	1,003	1,499	2,004	1.002x - 4.399	1.000
B92	SKC	224-PCXR3	510987	01/04/2026	1,000	1,500	2,000	997	1,495	2,000	1.004x - 9.780	1.000
B93	SKC	224-PCXR3	509845	03/04/2026	1,000	1,500	2,000	1,003	1,503	1,998	0.997x + 3.219	1.000

Calibrated by :	Approved by :
Adul Dangklom (Mr. Adul Dangklom)	(Mr. Peera Detudom)

ARCHEMICA

Certificate of Calibration

Aquion : Anion (ID#894)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

S.P.S. Consulting Service Co., Ltd.

ARCHEMICA LAB
บริษัท อาร์เคมีก้า แลบ จำกัด
ARCHEMICA LAB CO.,LTD.

Operator Signature : Teerapat B Date : Jun 6, 2025

(Mr. Teerapat Boonla)

Application Chemist

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbumru, Bangplud, Bangkok, 10700 Thailand
Tel. +66 2433 8331 Email : calibration@sithiphorn.com

SITHIPORN associates

ilac-MRA

NSC-TISI-TIS 17025
CALIBRATION 0354

Cert. No. : SP25026
Pages : 1 of 4

Calibration Certificate

Equipment :	UV-VIS SPECTROPHOTOMETER
Manufacturer :	PERKINELMER
Model :	LAMBDA 25
Serial No.:	501S14123010
ID No.:	SP03/58
Calibration Mode :	WAVELENGTH ACCURACY PHOTOMETRIC ACCURACY STRAY LIGHT
Condition As Found :	GOOD
Customer :	S.P.S CONSULTING SERVICE CO., LTD. 7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD, CHOMPHON SUB-DISTRICT, CHATUCHAK DISTRICT, BANGKOK PROVINCE 10900 THAILAND.
Location :	ORGANIC LABORATORY IV
Ambient Temperature :	(22.9 ± 5) °C
Relative Humidity :	(53.7 ± 25) %
Received Date :	22 AUGUST 2025
Calibration Date :	22 AUGUST 2025
Date of Issue :	25 AUGUST 2025

Calibrated by : Nitinun Srihawan

Approved by : Wichok B.
(Wichok Ekpongpradit)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

SITHIPORN associates

SITHIPORN ASSOCIATES
CALIBRATION LABORATORY

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 2 of 4

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01
The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution
The calibration procedure used was based on ASTM E275-01,ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	126461	24/10/2026
Didymium liquid	RM-DL	28912	126462	24/10/2026
Neutral density filter	RM-1N2N3N	13877	126457	24/10/2026
Potassium dichromate solutions	RM-0204060810	14204	126497	25/10/2026
Potassium Iodide solution	-	KI-0701-001	CI-0185-24	14/05/2026

2. This result of calibration was found accurate as shown on date and place of calibration only.
3. This certificate is traceable to the international system of unit maintained at :
   3.1 The UK National Physical Laboratory (NPL)

Result of calibration : Wavelength Accuracy

(Without adjustment)

Material	Certified Values of Reference Material (nm)	UUC* Reading (nm)	Error (nm)	Uncertainty ± (nm)	*k* Factor
RM-HL	278.13	278.21	0.08	0.16	2.00
	361.25	361.39	0.14	0.16	2.00
	467.82	467.71	-0.11	0.16	2.00
	536.56	536.50	-0.06	0.16	2.00
	640.50	640.36	-0.14	0.16	2.00
RM-DL	740.09	739.85	-0.24	0.16	2.00
	864.94	865.12	0.18	0.16	2.00

UUC* = Unit Under Calibration

Wichok B.

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 3 of 4

Result of calibration : Photometric Accuracy

Material	Wavelength (nm)	Filter S/N	Nominal Absorbance (A)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	*k* Factor
Neutral Density glass filter	440.0	29381	0.5	0.5443	0.5413	-0.0030	0.0043	2.00
		29914	0.7	0.7484	0.7455	-0.0029	0.0054	2.00
		29360	1.0	1.0527	1.0535	0.0008	0.0032	2.00
	465.0	29381	0.5	0.4948	0.4922	-0.0026	0.0041	2.00
		29914	0.7	0.6906	0.6877	-0.0029	0.0050	2.00
		29360	1.0	0.9695	0.9709	0.0014	0.0031	2.00
	546.1	29381	0.5	0.5090	0.5068	-0.0022	0.0036	2.00
		29914	0.7	0.6985	0.6960	-0.0025	0.0041	2.00
		29360	1.0	0.9814	0.9825	0.0011	0.0031	2.00
	590.0	29381	0.5	0.5375	0.5353	-0.0022	0.0034	2.00
		29914	0.7	0.7256	0.7231	-0.0025	0.0037	2.00
		29360	1.0	1.0213	1.0219	0.0006	0.0032	2.00
	635.0	29381	0.5	0.5223	0.5202	-0.0021	0.0033	2.00
		29914	0.7	0.6927	0.6901	-0.0026	0.0036	2.00
		29360	1.0	0.9744	0.9750	0.0006	0.0032	2.00

UUC* = Unit Under Calibration

Michou B.

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CALIBRATION LABORATORY

Cert. No. : SP25026
Job No. : VC68SP0019
Pages : 4 of 4

Result of calibration : Photometric Accuracy

(Without adjustment)

Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	*k* Factor
Potassium dichromate solutions	235.0	20	0.2415	0.2443	0.0028	0.0101	2.00
		40	0.4866	0.4871	0.0005	0.0115	2.00
		60	0.7415	0.7295	-0.0120	0.0067	2.00
		80	0.9854	0.9844	-0.0010	0.0071	2.00
		100	1.2444	1.2425	-0.0019	0.0073	2.00

UUC* = Unit Under Calibration

Condition of this result of calibration : Spectrophotometer PERKINELMER Model LAMBDA 25 S/N 501S14123010

Resolution of Wavelength Mode	0.1 nm
Resolution of Photometric Mode	0.001 A
Parameter Setting	
Measurement Mode	Wavelength, Absorbance
Wavelength Scan	190 nm - 1100 nm
Scanning Speed	7.5 nm/min
Band width(Wavelength)	1.0
Band width(Vis)	1.0
Band width(Uv)	1.0

Stray Light** UUC* Reading at 220.0 nm	
Transimission T(%)	**Absorbance(A)**
0.020	3.7032

**Specific Acceptance :
Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A
**Stray light not TISI Accredited

The reported uncertainty is based on a standard uncertainty mutiplied by a coverage factor *k*, providing a level of confidence of approximately 95%

End of Calibration Certificate