

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือตรวจวัดคุณภาพสิ่งแวดล้อม

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศจากปล่อง Total Suspended Particulate	Console No. B01, B03, B04 Pitot Tube No. B40, B47, B48	Digital Balance
Oxides of Nitrogen (NO _x)	Vacuum Gauge	Spectrophotometer
Carbon Monoxide	Personal Pump SKC No. B06, B07 Rotameter No. H-B05, B09	CO Analyzer No. B01
Aluminium	Console No. B03 Pitot Tube No. B47	ICP
VOCs	Personal Pump SKC No. B06 Rotameter No. L-B05, B09	GC/MS
2. คุณภาพอากาศในบรรยากาศ Total Suspended Particulate	High Volume Air Sampler Rec No. B40, Blow No. B40	Digital Balance
PM ₁₀	High Volume PM ₁₀ Air Sampler Rec No. B06, Blow No. B06	Digital Balance
Nitrogen Dioxide	NO ₂ Analyzer No. B07	NO ₂ Analyzer No. B07
Carbon Monoxide	CO Analyzer No. B12	CO Analyzer No. B12
Aluminium	High Volume Air Sampler Rec No. B25, Blow No. B25	ICP
3. ระดับเสียงบริเวณแนวรั้วโรงงาน L _{eq} 24 hr, L _{max} และ L ₉₀	Acoustic Calibrator Sound Level Meter ACO No. B17, B26, B42, B46 Sound Level SCARLET No. B18, B19, B24, B27	-
4. คุณภาพน้ำ pH	-	pH Meter
Total Dissolved Solids	-	Digital Balance
Total Suspended Solids	-	Digital Balance
BOD ₅	-	BOD Analyzer
Grease & Oil	-	Digital Balance
Lead	-	ICP
Aluminum	-	ICP
5. คุณภาพอากาศในสถานประกอบการ Total Dust	Personal Pump SKC No. B07, B52, B73, B86 Rotameter No. H-B04	Digital Balance
Respirable Dust	Personal Pump SKC No. B12, B37, B76 Rotameter No. H-B04	Digital Balance
Aluminium	Personal Pump SKC No. B05, B52, B85, B86 Rotameter No. H-B04	ICP
Hydrogen Fluoride	Personal Pump SKC No. B04, B85 Rotameter No. L-B04	Ion Chromatography
Hydrogen Chloride	Personal Pump SKC No. B73, B76 Rotameter No. L-B04	Ion Chromatography

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
6. ระดับเสียงในสถานประกอบการ L_{eq} 8 hr และ L_{max}	Acoustic Calibrator Sound Level Meter ACO No. B37, B44, C1-B02, C1-B04	-
7. ปริมาณเสียงสะสมแบบติดตัวบุคคล TWA	Acoustic Calibrator Sound Level Meter NMD No. B12, B14	-
8. ระดับความร้อนในสถานประกอบการ WBGT	Heat Stress WBGT Meter No. B05, B12, B17, B21, B25, B26, R05, R06	-
9. กลิ่นในสถานประกอบการ Ammonia	Personal Pump SKC No. B76 Rotameter No. H-B04	Spectrophotometer

คุณภาพอากาศจากปล่อง



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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

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_{ϕ} (mmH ₂ O)
B01	1563	02/03/2026	0.998	49.85
B02	8002514	02/03/2026	1.003	49.77
B03	1503016	03/03/2026	0.997	49.68
B04	00006659	03/03/2026	0.996	49.82
B05	00007428	02/03/2026	0.999	49.65
R01	1561	03/03/2026	1.002	49.98
R02	8002513	03/03/2026	1.004	49.56
R03	1570	03/03/2026	0.997	49.73
R04	8002519	03/03/2026	0.999	49.80
R05	1503015	02/03/2026	1.003	49.95

Remark : Accept Value of y (test) is $0.97 < y < 1.03$
Accept Value of ΔH_{ϕ} (test) is 46.7 ± 6.4 (mmH₂O)

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	02/02/2026	0.84	0.84
B04	S	0.99	02/02/2026	0.84	0.83
B05	S	0.99	03/02/2026	0.84	0.84
B07	S	0.99	04/02/2026	0.84	0.83
B08	S	0.99	04/02/2026	0.85	0.84
B09	S	0.99	04/02/2026	0.84	0.84
B11	S	0.99	03/02/2026	0.84	0.85
B16	S	0.99	03/02/2026	0.83	0.84
B18	S	0.99	03/02/2026	0.84	0.84
B19	S	0.99	02/02/2026	0.84	0.84
B21	S	0.99	02/02/2026	0.84	0.83
B24	S	0.99	02/02/2026	0.84	0.83
B27	S	0.99	02/02/2026	0.84	0.84
B30	S	0.99	03/02/2026	0.84	0.85
B31	S	0.99	03/02/2026	0.84	0.84
B33	S	0.99	03/02/2026	0.83	0.84
B35	S	0.99	04/02/2026	0.84	0.84

Remark : Accept value of Cp (test) is 0.84 ± 0.01

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	04/02/2026	0.85	0.84
B37	S	0.99	02/02/2026	0.84	0.83
B38	S	0.99	03/02/2026	0.83	0.84
B39	S	0.99	03/02/2026	0.85	0.84
B40	S	0.99	02/02/2026	0.84	0.84
B41	S	0.99	02/02/2026	0.83	0.84
B44	S	0.99	04/02/2026	0.84	0.84
B45	S	0.99	04/02/2026	0.85	0.84
B46	S	0.99	04/02/2026	0.83	0.84
B47	S	0.99	04/02/2026	0.84	0.85
B48	S	0.99	03/02/2026	0.84	0.84
B49	S	0.99	03/02/2026	0.85	0.84
B54	S	0.99	02/02/2026	0.84	0.84
B56	S	0.99	02/02/2026	0.84	0.83
B57	S	0.99	03/02/2026	0.84	0.85
B58	S	0.99	03/02/2026	0.84	0.84

Remark : Accept value of Cp (test) is 0.84 ± 0.01

Calibrated by :

(Mr. Adul Dangklom)

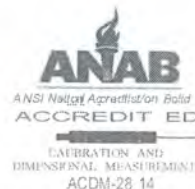
Approved by :

(Mr. Peera Detudom)



CALIBRATION LABORATORY Co.,LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-G353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE	VACUUM GAUGE
MANUFACTURER	HI-LIGHT
MODEL/TYPE	N/A
SERIAL NO.	N/A[64-220066-2]
CLID.NO.	212301420
JOB CONTROL NO.	240720076549

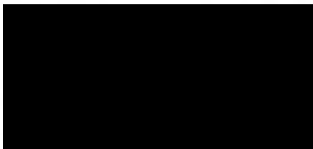
CUSTOMER S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24 ROAD., JOMPOL,
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED: 24 July 2025

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

Calibrated By : Sittipong Pimdee
Calibration Engineer

Approved By : 
Mongkol Yotsoontorn
Authorized Signatory
24 July 2025



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. Q24076549

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CALIBRATION AND
DIMENSIONAL MEASUREMENT
ACDM-2814

REPORT OF CALIBRATION

FOR

NOMENCLATURE	VACUUM GAUGE
MANUFACTURER	HI-LIGHT
MODEL/TYPE	N/A
SERIAL NO.	N/A [64-220066-2]
DATE OF CALIBRATION	23 July 2025
DUE DATE OF CALIBRATION	23 July 2026

ENVIRONMENT CONDITIONS

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity $(55 \pm 10) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPPP-05 according to DKD-R 6-1 as calibration guidelines.

The calibration was performed by direct measurement with Document Process Calibrator and Pressure Module which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Document Process Calibrator, Fluke Model 74 1B *S/N.* 8295020 with Pressure Module Model 700PD5 *S/N.* 89404505.

TRACEABILITY :

The measurement s are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).
Certificate No. MP-0040-24.

UNCERTAINTY :

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k=2$. It has been evaluated according to the "Calibration of Pressure Gauges (DKD-R 6-1)" which provides a level of confidence approximately 95%.

Certificate No. Q24076549

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CONDITION OF CALIBRATION ITEM :RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS: (X) without adjustment () adjustment

The DUC was exercised by applying a known pressure from its zero to full scale 1 times. Then 2 series of known gauge pressure were applied. The STD reading were recorded and the means value were reported in the table below.

CALIBRATION DATA

CORRECTION OF PRESSURE

DUC Test point (inHg)	STD Reading (kPa)		Conversion to inHg		Correction (inHg)	
	Up	Down	Up	Down	Up	Down
0	0.00	0.00	0.0	0.0	0.0	0.0
-5	-17.61	-17.95	-5.2	-5.3	+0.2	+0.3
-10	-34.54	-34.54	-10.2	-10.2	+0.2	+0.2
-15	-51.13	-51.47	-15.1	-15.2	+0.1	+0.2
-20	-67.72	-68.06	-20.0	-20.1	+0.0	+0.1
-25	-84.31	-84.31	-24.9	-24.9	+0.1	+0.1
-30	-101.24	-101.24	-29.9	-29.9	+0.1	+0.1

Uncertainty of measurement ± 0.2 inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 43 of 67

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

End of Certificate

Certificate No. Q24076549

F3-011-05/ 12-23



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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 $\pm$ 3 $^{\circ}$ C
Pressure : 1010 $\pm$ 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	691654	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 :

Approved by :

(Mr. Peera Detudom)

(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

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 :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

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 :

(Mr. Abdul Dangklom)

Approved by :

(Mr. Peera Detudom)



CERTIFICATE No : 26M2266
REFERENCE No : 80204-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
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 : [REDACTED]

ISSUED DATE : 06-Mar-26

RECEIVED DATE : 05-Mar-26





CERTIFICATE No : 26M2266

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar $\pm$ 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C $\pm$ 1° C RELATIVE HUMIDITY : 50 %RH $\pm$ 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 LINEARITY 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

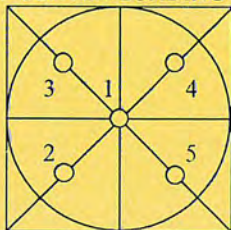
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ($\pm$ g)
0.00	0.00000	0.00000	0.000065
0.02	0.02000	0.00000	0.000065
0.10	0.10000	0.00000	0.000066
0.20	0.20000	0.00000	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00001	-0.00001	0.000066
2.00	2.00000	0.00000	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	10.00004	-0.00004	0.000070
20.00	20.00006	-0.00006	0.000078
50.00	50.00000	0.00000	0.00012
100.00	100.00002	-0.00002	0.00019
120.00	120.00002	-0.00002	0.00022

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
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



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 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

<u>Material</u>	<u>Ref. type</u>	<u>Cell serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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

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

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 multiplied by a coverage factor k , providing a level of confidence of approximately 95%

End of Calibration Certificate



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

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	01 April 2026	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.5 °C		% RH : 48	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	-0.10	-	0	
CO Span	40.00	40.03	0.075	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4014.2	mV	2500-4800 mV		
CO Reference	3948.1	mV	2500-4800 mV		
Measure/Reference Ratio	1.179	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.4	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	807	CC/Min	800 ± 10%		
Sample Temperature	48.2	°C	48 ± 4		
Bench Temperature	48.0	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3037.2	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

(Mr. Adul Dangklorn)

Approved by :

(Mr. Peera Detudorn)



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

Customer : <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>December 18, 2025</u>	
	Recommendation Recertification	
Address : <u>7 Soi Phaholyothin 24</u>	Period <u>6</u>	Months <u>Months</u>
<u>Paholyothin Road</u>	Recertification Due: <u>June 28, 2026</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	Date Last Certified: <u>July 1, 2025</u>	
User Name: <u>K.Phenpha Vipasthawatt</u>	Visit Number: <u>2of 2</u>	
Phone: <u>083-9269252</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>	
Fax: <u>02-513-4221</u>	PerkinElmer Fax: <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>November 30, 2026</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>July 30, 2026</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>August 30, 2026</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2026</u>
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401
DATE TESTED December 18, 2025
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 required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

4. PERFORMANCE CHECKS

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401			DATE TESTED : December 18, 2025		
PARAMETER	SPECIFICATION			FINAL VALUE	
Spectral Resolution : UV	As	193.696 nm	≤ 0.007	0.00530	
	Ni	231.604 nm	≤ 0.008	0.00708	
	Ni	341.476 nm	≤ 0.012	0.00776	
Spectral Resolution : VIS	La	408.672 nm	≤ 0.020	0.01614	
	Ba	455.403 nm	≤ 0.025	0.02377	
Precision					
	As	193.656 nm	% RSD < 1.0	0.67	%
	Zn	213.856 nm	% RSD < 1.0	0.62	%
	Mn	257.610 nm	% RSD < 1.0	0.88	%
	La	379.478 nm	% RSD < 1.0	0.63	%
	Ba	455.403 nm	% RSD < 1.0	0.65	%
	Ba	493.408 nm	% RSD < 1.0	0.45	%
Detection Limits : Axial	Tl	190.080 nm	3(sd)	3.21	ppb
	As	193.696 nm	3(sd)	6.06	ppb
	Pb	220.353 nm	3(sd)	0.92	ppb
Detection Limits : Radial	As	193.696 nm	3(sd)	17.35	ppb
	Zn	213.856 nm	3(sd)	1.79	ppb
	Mn	257.610 nm	3(sd)	0.18	ppb
	La	379.478 nm	3(sd)	0.76	ppb
	Ba	455.403 nm	3(sd)	0.11	ppb
	Ba	493.408 nm	3(sd)	0.56	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd	226.502 nm	≤ 150 ppb	40.52	
BEC : Radial (IB X 1000)/(IS-IB)	Mn	257.610 nm	≤ 45 ppb	42.33	



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401**DATE TESTED** December 18, 2025**Remarks :**

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed 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.

Authorized Representative:

(Wiphan Promlumda)

Service Engineer

GC Clarus 600/680 Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd		
Address (Instrument Location):	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
Serial Number:	680S14042502	Service Tag:	N68APSSFEMP
Customer Name (if applicable):	Ms.Naruecha	PM number:	1 of 2
Service Engineer Name:	Monchai Kitcharoenkeat	Service Order Number:	WO-11858723
Date PM Performed: (DD-MMM-YYYY)	13-Feb-2026	Next PM Due Date: (DD-MMM-YYYY)	13-Aug-2026

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC 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 #	Software Version	Configuration Notes
Clarus680	680S14042502	Totalchrom6.3.2	PSS, PSS, FID,
Clarus SQ8T	648N4050804	Turbomass 6.4	
AtomX	US14113002	Tekma AtomX	

Parts Lists

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)
N/A				
Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A				

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.

- ☒ Check incoming AC line voltage for proper levels and grounding.

L-N 220 Volt

L-G 220 Volt

N-G 0.46 Volt

**Neutral to ground not more than 0.5 volts peak to peak*

- ☒ Inspect all gas line filters and traps; Replace if necessary with customer supplied spares.

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

- ☒ Inspect the customer log book and make any appropriate PM entries.

- ☒ Leak check all fittings from the gas source to instrument.

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

- ☒ Inspect for functional and clean electronic cooling and oven vent fans

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

- ☐ Check sub-ambient option. (If installed).

Oven temperature set point 5 °C ☐ Pass ☐ Fail

- ☒ Perform routine maintenance on detector/injector. Replace parts as necessary with customer supplied spares.

- ☒ Check flows, including split flows if applicable. Calibrate if necessary.

Carrier flow	Pass
Split flow	Pass
- ☒ Check detector gas flows and adjust if necessary.

Detector flow	Pass
---------------	------
- ☒ Autosampler installed ☒ Yes ☐ No

Check autosampler sensor for wear and replace if necessary.	
Vial sensor	Pass
Door sensor	Pass
Tower sensor	Pass
Plunger sensor	Pass
Elevator sensor	Pass
- ☒ Remove syringe, manually flush. Replace with customer supplied spare if necessary.
- ☒ Check firmware version. Upgrade to current levels if necessary.

Firmware version	<u>6.5</u>
------------------	------------
- ☒ Measure all accessible power supply voltages.

5 Volt	Pass
+15 Volt	Pass
-15 Volt	Pass
24 Volt	Pass
- ☒ Record all detector voltage signal.

Detector Channel A	<u>0.87</u>	mV.
Detector Channel B	<u>NA</u>	mV.

3. Diagnostics Tests:

- ☒ Run instrument diagnostics.

☒ BRAM	Pass
☒ EPROM	Pass
- ☒ Run Autosampler diagnostics.

☒ BRAM	Pass
☒ EPROM	Pass

4. 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.
- ☒ Update Logbook.

Additional Comments

Additional Comments Regarding the PM

Review

<i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i>	
<i>This Clarus600/680 GC Pass the preventive maintenance.</i>	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: Monchai Kitcharoenkeat	Date: 13-Feb-2026 (DD-MMM-YYYY)
Authorized Customer Representative: Ms.Naruecha	Date: 13-Feb-2026 (DD-MMM-YYYY)

คุณภาพอากาศในบรรยากาศ



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

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	02/02/2026	y = 1.147x-3.983	0.998
B02	B02	02/02/2026	y = 1.158x-3.531	0.997
B03	B03	02/02/2026	y = 1.109x-2.595	0.999
B04	B04	02/02/2026	y = 1.123x-1.928	0.998
B05	B05	02/02/2026	y = 1.145x-3.659	0.999
B06	B06	02/02/2026	y = 1.100x-2.379	0.999
B07	B07	02/02/2026	y = 1.122x-2.377	0.999
B08	B08	02/02/2026	y = 1.102x-2.500	0.998
B09	B09	02/02/2026	y = 1.121x-3.479	0.999
B10	B10	02/02/2026	y = 1.143x-3.199	0.996
B11	B11	03/02/2026	y = 1.105x-1.251	0.999
B12	B12	03/02/2026	y = 1.136x-3.106	0.996
B13	B13	03/02/2026	y = 1.142x-2.536	0.998
B14	B14	03/02/2026	y = 1.135x-3.133	0.998
B15	B15	03/02/2026	y = 1.111x-2.932	0.998
B16	B16	04/02/2026	y = 1.104x-3.794	0.998
B17	B17	04/02/2026	y = 1.151x-2.773	0.998
B18	B18	04/02/2026	y = 1.140x-2.730	0.998
B19	B19	04/02/2026	y = 1.137x-2.624	0.998
B20	B20	04/02/2026	y = 1.139x-1.402	0.998
B21	B21	04/02/2026	y = 1.131x-1.657	0.999
B22	B22	04/02/2026	y = 1.166x-3.887	0.997
B23	B23	04/02/2026	y = 1.162x-4.278	0.998
B24	B24	04/02/2026	y = 1.128x-2.436	0.998
B25	B25	04/02/2026	Y = 1.159x-4.833	0.998
B26	B26	03/02/2026	y = 1.103x-1.969	0.997
B27	B27	04/02/2026	y = 1.149x-3.761	0.997
B28	B28	04/02/2026	y = 1.134x-3.377	0.999
B29	B29	04/02/2026	y = 1.118x-2.903	0.997
B30	B30	04/02/2026	y = 1.157x-2.504	0.999
B31	B31	04/02/2026	y = 1.165x-3.108	0.999
B32	B32	04/02/2026	y = 1.113x-2.480	0.999
B33	B33	04/02/2026	y = 1.155x-2.774	0.997
B34	B34	04/02/2026	y = 1.125x-1.905	0.997

Calibrated by :

(Mr. Adul Dangtom)

Approved by :

(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

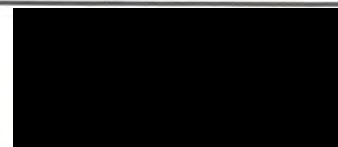
High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B35	B35	04/02/2026	$y = 1.154x - 3.696$	0.996
B36	B36	04/02/2026	$y = 1.119x - 2.463$	0.997
B37	B37	04/02/2026	$y = 1.129x - 3.721$	0.998
B38	B38	02/02/2026	$y = 1.182x - 2.931$	0.997
B39	B39	02/02/2026	$y = 1.062x - 1.512$	0.999
B40	B40	02/02/2026	$y = 1.163x - 3.556$	0.997
B41	B41	02/02/2026	$y = 1.116x - 1.975$	0.996
B42	B42	02/02/2026	$y = 1.152x - 4.140$	0.997
B43	B43	02/02/2026	$y = 1.167x - 3.646$	0.996
B44	B44	02/02/2026	$y = 1.178x - 4.362$	0.999
R01	R01	02/02/2026	$y = 1.097x - 2.630$	0.997
R02	R02	02/02/2026	$y = 1.138x - 3.218$	0.996
R03	R03	02/02/2026	$y = 1.133x - 3.084$	0.998
R04	R04	02/02/2026	$y = 1.121x - 2.102$	0.998
R05	R05	02/02/2026	$y = 1.041x + 0.894$	0.997
R06	R06	02/02/2026	$y = 1.075x + 0.254$	0.997
R07	R07	03/02/2026	$y = 1.126x - 2.841$	0.996
R08	R08	03/02/2026	$y = 1.091x - 2.104$	0.996
R09	R09	03/02/2026	$y = 1.065x + 0.557$	0.996
R10	R10	03/02/2026	$y = 1.093x - 1.217$	0.999
R11	R11	03/02/2026	$y = 1.130x - 3.938$	0.999
R12	R12	05/02/2026	$y = 1.164x - 2.698$	0.997
R13	R13	05/02/2026	$y = 1.120x - 3.336$	0.998
R14	R14	05/02/2026	$y = 1.034x + 0.445$	0.997
R15	R15	05/02/2026	$y = 1.076x + 0.429$	0.998
R16	R16	05/02/2026	$y = 1.107x - 1.468$	0.996
R17	R17	05/02/2026	$y = 1.078x - 1.668$	0.998
R18	R18	05/02/2026	$y = 1.160x - 5.001$	0.997
R19	R19	05/02/2026	$y = 1.077x - 2.680$	0.997
R20	R20	05/02/2026	$y = 1.185x - 4.839$	0.998

Calibrated by :



(Mr. Adul Dangklom)

Approved by :



(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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High Volume PM-10 Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3611

Calibration Data

High Volume PM-10 Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B01	B01	02/02/2026	$y = 1.066x - 0.702$	0.998
B02	B02	02/02/2026	$y = 1.076x + 0.303$	0.999
B03	B03	02/02/2026	$y = 1.040x + 0.622$	0.997
B04	B04	02/02/2026	$y = 1.135x - 2.410$	0.998
B05	B05	02/02/2026	$y = 1.073x - 1.284$	0.997
B06	B06	02/02/2026	$y = 1.017x + 2.340$	0.998
B07	B07	02/02/2026	$y = 1.036x + 0.117$	0.998
B08	B08	02/02/2026	$y = 1.144x - 2.648$	0.997
B09	B09	02/02/2026	$y = 1.115x - 4.423$	0.999
B10	B10	02/02/2026	$y = 1.090x - 2.056$	0.999
B11	B11	03/02/2026	$y = 1.112x - 3.640$	0.997
B12	B12	03/02/2026	$y = 1.136x - 4.495$	0.997
B13	B13	03/02/2026	$y = 1.119x - 2.873$	0.999
B14	B14	03/02/2026	$y = 1.145x - 3.948$	0.996
B15	B15	03/02/2026	$y = 1.137x - 2.722$	0.999
B16	B16	03/02/2026	$y = 1.087x + 0.251$	0.997
B17	B17	03/02/2026	$y = 1.096x - 0.862$	0.998
B18	B18	03/02/2026	$y = 1.111x - 3.264$	0.996
B19	B19	03/02/2026	$y = 1.081x + 0.507$	0.998
B20	B20	03/02/2026	$y = 1.137x - 3.001$	0.999
B21	B21	03/02/2026	$y = 1.129x - 3.073$	0.999
B22	B22	03/02/2026	$y = 1.130x - 2.275$	0.998
B23	B23	03/02/2026	$y = 1.149x - 4.649$	0.997
B24	B24	03/02/2026	$y = 1.103x - 2.139$	0.999
B25	B25	03/02/2026	$y = 1.065x - 1.466$	0.999
B26	B26	03/02/2026	$y = 1.035x + 0.731$	0.998
B27	B27	03/02/2026	$y = 1.102x - 2.849$	0.998
B28	B28	03/02/2026	$y = 1.138x - 3.306$	0.996
B29	B29	03/02/2026	$y = 1.046x + 0.180$	0.997
B30	B30	03/02/2026	$y = 1.140x - 5.125$	0.999
B31	B31	03/02/2026	$y = 1.028x + 0.644$	0.998
B32	B32	04/02/2026	$y = 1.044x + 1.254$	0.999
B33	B33	04/02/2026	$y = 1.106x - 2.101$	0.999
B34	B34	04/02/2026	$y = 1.059x + 0.598$	0.998

Calibrated by :

(Mr. Adut Dangtom)

Approved by :

(Mr. Peera Detudom)



CERTIFICATE No : 26M2266
REFERENCE No : 80204-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
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 : [REDACTED]

ISSUED DATE : 06-Mar-26

RECEIVED DATE : 05-Mar-26





CERTIFICATE No : 26M2266

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar $\pm$ 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C $\pm$ 1° C RELATIVE HUMIDITY : 50 %RH $\pm$ 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 LINEARITY 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

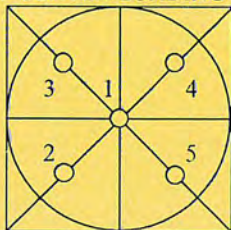
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ($\pm$ g)
0.00	0.00000	0.00000	0.000065
0.02	0.02000	0.00000	0.000065
0.10	0.10000	0.00000	0.000066
0.20	0.20000	0.00000	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00001	-0.00001	0.000066
2.00	2.00000	0.00000	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	10.00004	-0.00004	0.000070
20.00	20.00006	-0.00006	0.000078
50.00	50.00000	0.00000	0.00012
100.00	100.00002	-0.00002	0.00019
120.00	120.00002	-0.00002	0.00022

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
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





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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 18 May 2026

BRAND : API

MODEL : 200E

NO. NOX-B07

SERIAL NO. 4338

Calibrator (Dilution System)

Brand : API

Model : 700

Last Cal. Date : 01 September 2025

Serial No. : 911

Reference Standard Gas

Standard Gas : Nitric Oxide (NO)

Cylinder No. : A006745V

Certified Date : 12 March 2025

Expired Date : 12 March 2028

Cylinder Conc. : 48.7 ppm

CALIBRATING CONDITION

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 50

CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	399.9	-0.025	400.0	1.009
NO _x Span	400	400.1	0.025	400.0	1.012

API Model 200E NO_x Analyzer Check List

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	500 standard
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air
SAMPLE FLOW	506	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.2	mV	-20 - 150
AZERO	93.9	mV	-20 - 150
HVPS	670	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.3	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	314.9	°C	315 ± 5
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant
NO Span Conc	400	PPB	20 - 20,000
NO _x Span Conc	400	PPB	20 - 20,000
NO Slope	1.009	-	1.0 ± 0.3
NO _x Slope	1.012	-	1.0 ± 0.3
NO Offset	1.5	mV	-20 to +150
NO _x Offset	0.9	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr.Peera Detudom)



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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

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	18 May 2026	Brand :	Thermo	Model :	48C
No.	CO-B12	Serial No.	TL-65343-348		
Calibrator (Dilution System)					
Brand	: API		Model	: 700	
Last Cal. Date	: 01 September 2025		Serial No.	: 911	
Reference Standard Gas					
Standard Gas	: Carbon Monoxide (CO)		Cylinder No.	: D711839	
Certified Date	: 14 March 2024	Expired Date	: 14 March 2032	Cylinder Conc.	: 4,580 ppm
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
Calibration Setting					
Span	Initial Reading (Before Adj.),PPM			Final Reading (After Adj.),PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.11	-	0	
CO Span	40.00	40.04	0.100	40.00	
Instrument Status					
Chamber Temp	47.4	°C	Flow	1.5	LPM
Pressure	730.8	mm Hg	Motor Speed	100.00%	

Calibrated by :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

Customer : <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>December 18, 2025</u>	
	Recommendation Recertification	
Address : <u>7 Soi Phaholyothin 24</u>	Period <u>6</u> Months	
<u>Paholyothin Road</u>	Recertification Due: <u>June 28, 2026</u>	
<u>Jompol Chatuchak, Bangkok 10900</u>	Date Last Certified: <u>July 1, 2025</u>	
User Name: <u>K.Phenpha Viphasathawat</u>	Visit Number: <u>2 of 2</u>	
Phone: <u>083-9269252</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>	
Fax: <u>02-513-4221</u>	PerkinElmer Fax: <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>November 30, 2026</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>July 30, 2026</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>August 30, 2026</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2026</u>
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401DATE TESTED December 18, 2025**1. MECHANICAL CHECKS**

- A. Inspect and clean all fans and filters.
- B. Inspect and replace as necessary, all torch components including the RF coil.
- C. Inspect all tubing for sign of clacking or leaking.
- D. Adjust water and gas pressure regulator settings.
- E. Inspect and leak check pneumatics drawers.
- F. Clean the exterior of the instrument.

☐ OK☐ OK☐ OK☐ OK☐ OK☐ OK**2. OPTICAL CHECKS**

- A. Inspect and clean all optical components.
- B. As required, check and replace all purgefilters.
- C. Recheck optical alignment.

☐ OK☐ OK☐ OK**3. COOLING SYSTEM CHECKS**

- A. Perform preventive maintenance on chiller.
- B. Flush out the chiller every year.

☐ OK☐ N/A**4. PERFORMANCE CHECKS**

- A. Torch View Alignment.
- B. Wavelength Calibration.

☐ OK☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401			DATE TESTED : December 18, 2025		
PARAMETER	SPECIFICATION			FINAL VALUE	
Spectral Resolution : UV	As	193.696 nm	≤ 0.007	0.00530	
	Ni	231.604 nm	≤ 0.008	0.00708	
	Ni	341.476 nm	≤ 0.012	0.00776	
Spectral Resolution : VIS	La	408.672 nm	≤ 0.020	0.01614	
	Ba	455.403 nm	≤ 0.025	0.02377	
Precision					
	As	193.656 nm	% RSD < 1.0	0.67	%
	Zn	213.856 nm	% RSD < 1.0	0.62	%
	Mn	257.610 nm	% RSD < 1.0	0.88	%
	La	379.478 nm	% RSD < 1.0	0.63	%
	Ba	455.403 nm	% RSD < 1.0	0.65	%
	Ba	493.408 nm	% RSD < 1.0	0.45	%
Detection Limits : Axial	Tl	190.080 nm	3(sd)	3.21	ppb
	As	193.696 nm	3(sd)	6.06	ppb
	Pb	220.353 nm	3(sd)	0.92	ppb
Detection Limits : Radial	As	193.696 nm	3(sd)	17.35	ppb
	Zn	213.856 nm	3(sd)	1.79	ppb
	Mn	257.610 nm	3(sd)	0.18	ppb
	La	379.478 nm	3(sd)	0.76	ppb
	Ba	455.403 nm	3(sd)	0.11	ppb
	Ba	493.408 nm	3(sd)	0.56	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd	226.502 nm	≤ 150 ppb	40.52	
BEC : Radial (IB X 1000)/(IS-IB)	Mn	257.610 nm	≤ 45 ppb	42.33	



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401**DATE TESTED** December 18, 2025**Remarks :**

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed 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.

Authorized Representative:

()

Wiphan Promlumda

Service Engineer

ระดับเสียงบริเวณริมรั้วโรงงาน



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 : $(23 + 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

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

1 /

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. 21-69/0204

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 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, 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	$\pm 1.0\%$

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	$\pm 3.0\%$

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 : 2011269012900497001

End of Certificate

2 / 2

The results relate only to the items tested/calibrated or value assigned.

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FM.BL.MTC.002 Rev.5

Head Office

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Office/Laboratory

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Office

196 Phahonyothin Road, Ladyao, Chatuchak, 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_073/26

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-B17	ACO	6236	00172042	03 March 2026	93.9	93.9
ACO-B26	ACO	6236	00182007	03 March 2026	93.8	93.9
ACO-B42	ACO	6236	00192033	03 March 2026	93.9	93.9
ACO-B46	ACO	6236	00222305	03 March 2026	93.8	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

Calibrated by :

(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

Noise B_311/26

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-B18	SCARLET	ST-12D	10352316	10 June 2026	93.7	93.9
ST-C1-B19	SCARLET	ST-12D	10352320	10 June 2026	93.9	93.9
ST-C1-B24	SCARLET	ST-12D	10352330	10 June 2026	93.8	93.9
ST-C1-B27	SCARLET	ST-12D	10352334	10 June 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)

คุณภาพน้ำ



Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

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



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : pH METER
MANUFACTURER : HANNA
MODEL / TYPE : HI3512/HI1332/HI7662-T
SERIAL NO. : 08685754/11250B7M/092806BN[PH04/56]
CLID. NO. : 272501562
JOB CONTROL NO. : 250617070523
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

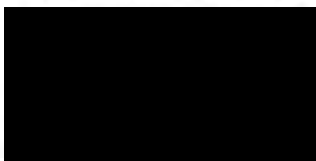
CUSTOMER : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24 ROAD, JOMPOL,
CHATUCHAK, BANGKOK 10900

DATE OF RECEIVED : 17 June 2025

DATE OF ISSUED : 20 June 2025

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
20 June 2025



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

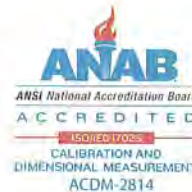
Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4



@clccalibration



REPORT OF CALIBRATION

FOR

NOMENCLATURE : **pH METER**
MANUFACTURER : **HANNA**
MODEL / TYPE : **HI3512/HI1332/HI7662-T**
SERIAL NO. : **08685754/11250B7M/092806BN[PH04/56]**
DATE OF CALIBRATION : **18 June 2025**

ENVIRONMENT CONDITIONS :

Temperature : $(25 \pm 2.5) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-01** [pH Meter]. The calibration was performed by direct measurement with Certified Reference Material (CRM).

This instrument was calibrated under procedure No. **CLC-CPTH-04** [Temperature] based on **ASTM E 644-04** as calibration guidelines. The calibration was performed by using Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. pH Standard Solution, NIMT TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. pH Standard Solution, Control Company Catalog Number 06664260,11754256, Lot Number CC787362.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F250 S/N. 1334023800.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.





CALIBRATION LABORATORY CO., LTD.

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



TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).
Lot Number. 080124 , 120124. Due Date 23 January 2026.
2. The measurements are traceable to International System of Units (SI) , through Control Company.
Certificate No. 4281-14495731 , Due Date 27 September 2025.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.
Certificate No. Q24120999, Due Date 26 November 2025.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 1042/67, Due Date 16 October 2025.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).
Certificate No. TT-0146-24, Due Date 28 October 2025.

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)"

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration



CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

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



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 pH meter.

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement ($\pm$ pH)	k Factor
4.003	4.005	168.2	-0.002	0.010	2,00
7.005	7.010	-8.1	-0.005	0.013	2,00
10.015	10.010	-177.7	+0.005	0.014	2,00

Technical Note. Setting function CAL 3 point (4,7,10).

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 4 of 68

2. TEMPERATURE RESULT

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty $\pm$ (°C)
100	25.00	25.0	0.00	0.07

Technical Note. Type of sensor : Thermistor

Probe $\varnothing$ 3 mm

Materials : Metal Sheath.

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of $k = 2,00$.

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 56 of 68

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

End of Certificate

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration



CERTIFICATE No : 26M2268

REFERENCE No : 80204-3

PAGE : 1 OF 2

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 : 

ISSUED DATE : 06-Mar-26

RECEIVED DATE : 05-Mar-26





CERTIFICATE No : 26M2268

PAGE : 2 OF 2

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 $\pm$ 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C $\pm$ 1° C RELATIVE HUMIDITY : 50 %RH $\pm$ 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 LINEARITY 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

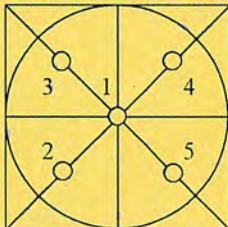
2. TARE FUNCTION : NORMAL

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 ($\pm$ 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



CERT.No.: HS-X014C

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

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)



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

Customer : <u>S.P.S.Consulting Service Co.,Ltd</u>	Date Tested: <u>December 18, 2025</u>	
	Recommendation Recertification	
Address : <u>7 Soi Phaholyothin 24</u>	Period <u>6</u> Months	
<u>Paholyothin Road</u>	Recertification Due: <u>June 28, 2026</u>	
<u>Jompol Chatuchak, Bangkok 1090</u>	Date Last Certified: <u>July 1, 2025</u>	
User Name: <u>K.Phenpha Viphasathawat</u>	Visit Number: <u>2 of 2</u>	
Phone: <u>083-9269252</u>	PerkinElmer Phone: <u>02-719-6420 ext 206</u>	
Fax: <u>02-513-4221</u>	PerkinElmer Fax: <u>02-318-5597</u>	

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>November 30, 2026</u>
<u>Wavecal Solution</u>	<u>N058-2152</u>	<u>July 30, 2026</u>
<u>VIS Wavecal solution</u>	<u>N930-2946</u>	<u>August 30, 2026</u>
<u>Instrument Cal. STD4</u>	<u>N930-0221</u>	<u>November 30, 2026</u>
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
<u>2 % HNO3</u>		
<u>10 % HNO3</u>		



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401
DATE TESTED December 18, 2025
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 required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

4. PERFORMANCE CHECKS

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401			DATE TESTED : December 18, 2025		
PARAMETER	SPECIFICATION			FINAL VALUE	
Spectral Resolution : UV	As	193.696 nm	≤ 0.007	0.00530	
	Ni	231.604 nm	≤ 0.008	0.00708	
	Ni	341.476 nm	≤ 0.012	0.00776	
Spectral Resolution : VIS	La	408.672 nm	≤ 0.020	0.01614	
	Ba	455.403 nm	≤ 0.025	0.02377	
Precision					
	As	193.656 nm	% RSD < 1.0	0.67	%
	Zn	213.856 nm	% RSD < 1.0	0.62	%
	Mn	257.610 nm	% RSD < 1.0	0.88	%
	La	379.478 nm	% RSD < 1.0	0.63	%
	Ba	455.403 nm	% RSD < 1.0	0.65	%
	Ba	493.408 nm	% RSD < 1.0	0.45	%
Detection Limits : Axial	Tl	190.080 nm	3(sd)	3.21	ppb
	As	193.696 nm	3(sd)	6.06	ppb
	Pb	220.353 nm	3(sd)	0.92	ppb
Detection Limits : Radial	As	193.696 nm	3(sd)	17.35	ppb
	Zn	213.856 nm	3(sd)	1.79	ppb
	Mn	257.610 nm	3(sd)	0.18	ppb
	La	379.478 nm	3(sd)	0.76	ppb
	Ba	455.403 nm	3(sd)	0.11	ppb
	Ba	493.408 nm	3(sd)	0.56	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd	226.502 nm	≤ 150 ppb	40.52	
BEC : Radial (IB X 1000)/(IS-IB)	Mn	257.610 nm	≤ 45 ppb	42.33	



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401**DATE TESTED** December 18, 2025**Remarks :**

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed 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

Authorized Representative:

(Wiphan Promlumda)

Service Engineer

คุณภาพอากาศในสถานประกอบการ



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

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	691654	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 :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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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								
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	529341	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	505975	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 :

(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

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
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	510785	01/04/2026	1,000	1,500	2,000	1,009	1,500	1,993	0.994x + 6.437	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 :

(Mr. Adul Dangkom)

Approved by :

(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 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 :

(Mr. Adul Dangklom)

Approved by :

(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

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 :


 (Mr. Abdul Dangklom)

Approved by :


 (Mr. Peera Detudom)



CERTIFICATE No : 26M2266

REFERENCE No : 80204-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : METTLER TOLEDO

MODEL : XS105DU

SERIAL No : 1126422905

ID No : BA 05/50

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 : [REDACTED]

ISSUED DATE : 06-Mar-26

RECEIVED DATE : 05-Mar-26





CERTIFICATE No : 26M2266

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar $\pm$ 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C $\pm$ 1° C RELATIVE HUMIDITY : 50 %RH $\pm$ 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 LINEARITY 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

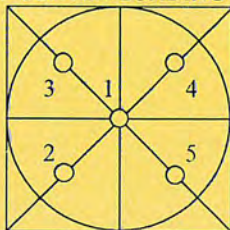
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ($\pm$ g)
0.00	0.00000	0.00000	0.000065
0.02	0.02000	0.00000	0.000065
0.10	0.10000	0.00000	0.000066
0.20	0.20000	0.00000	0.000066
0.50	0.50001	-0.00001	0.000065
1.00	1.00001	-0.00001	0.000066
2.00	2.00000	0.00000	0.000067
5.00	5.00001	-0.00001	0.000068
10.00	10.00004	-0.00004	0.000070
20.00	20.00006	-0.00006	0.000078
50.00	50.00000	0.00000	0.00012
100.00	100.00002	-0.00002	0.00019
120.00	120.00002	-0.00002	0.00022

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
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 MULTIPLYING
COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT





MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

Customer : S.P.S.Consulting Service Co.,Ltd	Date Tested:	December 18, 2025
	Recommendation Recertification	
Address : 7 Soi Phaholyothin 24	Period	6 Months
Paholyothin Road	Recertification Due:	June 28, 2026
Jompol Chatuchak, Bangkok 1090	Date Last Certified:	July 1, 2025
User Name: K.Phenpha Vipasthawatt	Visit Number:	2 of 2
Phone: 083-9269252	PerkinElmer Phone:	02-719-6420 ext 206
Fax: 02-513-4221	PerkinElmer Fax:	02-318-5597

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
OPTIMA 5300DV	077C7042401	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
IPV Methods		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Multielement Standard	N069-1579	November 30, 2026
Wavecal Solution	N058-2152	July 30, 2026
VIS Wavecal solution	N930-2946	August 30, 2026
Instrument Cal. STD4	N930-0221	November 30, 2026
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS
2 % HNO3		
10 % HNO3		



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401
DATE TESTED December 18, 2025
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 required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

4. PERFORMANCE CHECKS

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER : 077C7042401			DATE TESTED : December 18, 2025		
PARAMETER	SPECIFICATION			FINAL VALUE	
Spectral Resolution : UV	As	193.696 nm	≤ 0.007	0.00530	
	Ni	231.604 nm	≤ 0.008	0.00708	
	Ni	341.476 nm	≤ 0.012	0.00776	
Spectral Resolution : VIS	La	408.672 nm	≤ 0.020	0.01614	
	Ba	455.403 nm	≤ 0.025	0.02377	
Precision					
	As	193.656 nm	% RSD < 1.0	0.67	%
	Zn	213.856 nm	% RSD < 1.0	0.62	%
	Mn	257.610 nm	% RSD < 1.0	0.88	%
	La	379.478 nm	% RSD < 1.0	0.63	%
	Ba	455.403 nm	% RSD < 1.0	0.65	%
	Ba	493.408 nm	% RSD < 1.0	0.45	%
Detection Limits : Axial	Tl	190.080 nm	3(sd)	3.21	ppb
	As	193.696 nm	3(sd)	6.06	ppb
	Pb	220.353 nm	3(sd)	0.92	ppb
Detection Limits : Radial	As	193.696 nm	3(sd)	17.35	ppb
	Zn	213.856 nm	3(sd)	1.79	ppb
	Mn	257.610 nm	3(sd)	0.18	ppb
	La	379.478 nm	3(sd)	0.76	ppb
	Ba	455.403 nm	3(sd)	0.11	ppb
	Ba	493.408 nm	3(sd)	0.56	ppb
BEC : Axial (IB X 500)/(IS-IB)	Cd	226.502 nm	≤ 150 ppb	40.52	
BEC : Radial (IB X 1000)/(IS-IB)	Mn	257.610 nm	≤ 45 ppb	42.33	



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401**DATE TESTED** December 18, 2025**Remarks :**

Commissioning follow as commissioning performance sheets.

This is to certify that the above tests have been performed 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.

Authorized Representative:

(Wiphan Promlumda)

Service Engineer



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.



Operator Signature : _____

Date : Jun 6, 2025

(Mr. Teerapat Boonla)

Application Chemist

ระดับเสียงในสถานประกอบการ



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 : $(23 \pm 3) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

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

1

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

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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 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, 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 Brüel&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 Brüel&Kjaer 4180	999.9	-0.1	± 1.5	$\pm 1.0\%$

3. Total Distortion

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

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 : 2011269012900497001

End of Certificate

2 / 2

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 2577 9036
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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

196 Phahonyothin Road, Ladyao, Chatuchak, 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_133/26

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-B37	ACO	6236	00192028	01 April 2026	93.9	93.9
ACO-B44	ACO	6236	00222302	01 April 2026	93.7	93.9
ACO-C1-B02	ACO	6238	00223039	01 April 2026	93.9	93.9
ACO-C1-B04	ACO	6238	00223041	01 April 2026	93.8	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

Calibrated by :

(Mr. Adul Dangkiom)

Approved by :

(Mr. Peera Detudom)

ปริมาณเสียงสะสมแบบติดตัวบุคคล



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 : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

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

1

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. 21-68/0514

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 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, 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	$\pm 2.0\%$

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	$\pm 4.0\%$

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

2 / 2

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,
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Fax. (66) 0 2577 9009

Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
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Office

196 Phahonyothin Road, Ladyao, Chatuchak,
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 Dose B_133_1/26

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-B06	SVANTEK	SV-104IS	80816	01 April 2026	114.1	114.0
NMD-B12	SVANTEK	SV-104IS	80832	01 April 2026	114.0	114.0
NMD-B13	SVANTEK	SV-104IS	80834	01 April 2026	113.9	114.0
NMD-B14	SVANTEK	SV-104IS	80875	01 April 2026	114.0	114.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					114.02± 0.10 dB	

Calibrated by :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)

ระดับความร้อนในสถานประกอบการ



Certificate of Calibration

Certificate Number : SPR25100063-9

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 : TEH060047

ID. Number : B05

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 06 Oct 2025

Relative Humidity : $50\% \pm 15\%$

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

Approved by

Calibration Officer



(Mr. Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR25100063-9

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 :
NA - NA Caltechnologies Co., Ltd.

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



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 -



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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_001_1

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B05	Verification Date	: 06 January 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	47.2	-0.1	± 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 :

(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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 : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 06 Oct 2025

Relative Humidity : $50\% \pm 15\%$

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

Approved by

Calibration Officer



(Mr. Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR25100063-10

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 :

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR25100063-10

Page : 3 of 3

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 -



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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_001_2

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B12	Verification Date	: 06 January 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	12.7	-0.2	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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 : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 06 Oct 2025

Relative Humidity : $50\% \pm 15\%$

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

Approved by

Calibration Officer



(Mr.Pootthipong A.)

Authorized Signatory

SP-FM-04-15 rev.0



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 :

NA - NA Caltechnologies Co., Ltd.

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



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 -



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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_001_3

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B17	Verification Date	: 06 January 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	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.0	0.1	± 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 :

(Mr. Adul Dangtorn)

Approved by :

(Mr. Peera Detudom)



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 : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 30 Jan 2026

Relative Humidity : $50\% \pm 15\%$

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

Approved by

Calibration Officer



(Mr.Worapong Sinthusopa)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR26010387-3

Page : 2 of 3

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 :

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR26010387-3

Page : 3 of 3

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 -



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, Chaluchak, Bangkok 10900

Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com, www.spscon.com

Heat B_001_4

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B21	Verification Date	: 06 January 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	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 :

[Redacted Signature]

(Mr. Adat Dangsom)

Approved by :

[Redacted Signature]

(Mr. Peera Detudom)



Certificate of Calibration

Certificate Number : SPR25100063-2 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 32		
Serial Number	: TPH050019		
ID. Number	: B25		
Environmental Conditions			
Ambient Temperature	: 23 °C ± 2 °C	Received Date	: 06 Oct 2025
Relative Humidity	: 50 % ± 15 %	Calibration Date	: 08 Oct 2025
Location of Calibration	: In-Lab	Recommend Due Date	: 08 Oct 2026
Calibration Procedure	: SP-CPT-04-13	Date of Issue	: 09 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.Navaporn Uengseng

Approved by

Calibration Officer



(Mr.Pootthipong A.)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR25100063-2

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 :

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR25100063-2

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.0	-0.014	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.018	40.0	-0.018	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.9	-0.114	0.20
35.0	35.012	34.9	-0.112	0.20
40.0	40.018	39.9	-0.118	0.20

Temperature Accuracy in the Measurement. (GLOVE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	30.0	-0.014	0.20
35.0	35.012	35.0	-0.012	0.20
40.0	40.018	40.0	-0.018	0.20

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 -





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_134_1

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B25	Verification Date	: 01 April 2026
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 32	Barometric Pressure	: 1011 mmbar
Serial No.	: TPH050019	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	47.3	-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 :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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 : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Relative Humidity : $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 11 Mar 2026

Calibration Date : 14 Mar 2026

Recommend Due Date : 14 Mar 2027

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

Approved by

Calibration Officer



(Mr. Worapong Sinthusopa)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR26030173-2

Page : 2 of 3

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 :

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR26030173-2

Page : 3 of 3

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 -

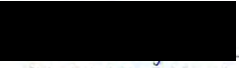
SP-FM-04-15 REV.0

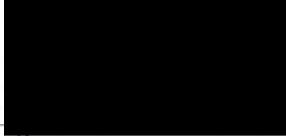


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S.P.S. CONSULTING SERVICE CO., LTD.
7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900
Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com.,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

Heat B_134_2

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: B26	Verification Date	: 01 April 2026
Brand	: Quest Technologies	Ambient Temp.	: 24.5 °C
Model	: QUESTemp ^o 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	69.3	0.0	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by : 
(Mr. Adul Dangklom)

Approved by : 
(Mr. Peera Detudom)



Certificate of Calibration

Certificate Number : SPR25100063-3

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 : MCD070028

ID. Number : R06

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Relative Humidity : $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 06 Oct 2025

Calibration Date : 08 Oct 2025

Recommend Due Date : 08 Oct 2026

Date of Issue : 09 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. Navaporn Uengseng

Approved by

Calibration Officer



(Mr. Pootthipong A.)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR25100063-3

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 :

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR25100063-3

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.8	-0.214	0.20
35.0	35.012	34.8	-0.212	0.20
40.0	40.018	39.8	-0.218	0.20

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.9	-0.114	0.20
35.0	35.012	34.9	-0.112	0.20
40.0	40.018	39.9	-0.118	0.20

Temperature Accuracy in the Measurement. (GLOVE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.014	29.9	-0.114	0.20
35.0	35.012	34.9	-0.112	0.20
40.0	40.018	39.9	-0.118	0.20

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 -



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_134_3

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R06	Verification Date	: 01 April 2026
Brand	: METROSONICS	Ambient Temp.	: 24.5 °C
Model	: hs-32	Barometric Pressure	: 1011 mmbar
Serial No.	: MCD070028	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	47.2	-0.1	± 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 :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



Certificate of Calibration

Certificate Number : SPR26010387-2

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 : Metrosonics

Model : hs-32

Serial Number : MCD070035

ID. Number : R05

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 30 Jan 2026

Relative Humidity : $50\% \pm 15\%$

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

Approved by

Calibration Officer



(Mr.Worapong Sinthusopa)

Authorized Signatory

SP-FM-04-15 rev.0

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



Calibration Report

Certificate Number : SPR26010387-2

Page : 2 of 3

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 :

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR26010387-2

Page : 3 of 3

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	39.7	-0.317	0.21

Temperature Accuracy in the Measurement. (DRY)

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	39.7	-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	39.7	-0.317	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 -



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_134_4

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No.	: R05	Verification Date	: 01 April 2026
Brand	: METROSONICS	Ambient Temp.	: 24.5 °C
Model	: hs-32	Barometric Pressure	: 1011 mmbar
Serial No.	: MCD070035	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 :

(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)

กลิ่นในสถานประกอบการ

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 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

<u>Material</u>	<u>Ref. type</u>	<u>Cell serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
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

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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

Cert. No. : SP25026

Job No. : VC68SP0019

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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 multiplied by a coverage factor k , providing a level of confidence of approximately 95%

End of Calibration Certificate