

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

ตรวจวัดคุณภาพสิ่งแวดล้อม

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพอากาศในบรรยากาศ		
Total Suspended Particulate (TSP)	High Volume Air Sampler No. B01, B23, B24	Digital Balance
Sulfur Dioxide (SO ₂)	Gas Sampler Box No. B05, B12, B13	Spectrophotometer
Nitrogen Dioxide (NO ₂)	NO ₂ Analyzer No. B08, B15, B20	NO ₂ Analyzer No. B08, B15, B20
Acetaldehyde	Flow Meter	GC/MS
1,4-Dioxane	Flow Meter	GC/MS
คุณภาพอากาศจากปล่องระบาย		
Particulate	Console No. B04, R04 Pitot Tube No. B04, B35	Digital Balance
Oxides of Nitrogen	Vacuum Gauge	Spectrophotometer
Carbon Monoxide	Personal Pump SKC No. B17, B42, B52 Rotameter H-B02, B09	CO Analyzer No. B14
Sulfur Dioxide	Personal Pump SKC No. B06, B42 Rotameter H-B02, B09	Digital Balance
Total VOC	Personal Pump SKC No. B17, B42, B52 Rotameter H-B02, B09	VOC Analyzer No. B02
Acetaldehyde	Personal Pump SKC No. B52 Rotameter No. L-B02	GC/FID
ระดับเสียงในบรรยากาศ		
L _{eq} 24 hr, L _{max} , L ₉₀	Acoustic Calibrator Sound Level Meter ACO-C1 No. B03 ST-C1 No. B09, B18, B20, B24, B27	-
คุณภาพน้ำ		
pH	-	pH Meter
Temperature	-	Liquid in Glass Thermometer
Total Suspended Solids	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
คุณภาพอากาศในสถานประกอบการ ไอระเหย Ethylene Glycol (EG)	Personal Pump SKC No. B45, B53, B54, B82 Rotameter No. H-B03, B10	GC/FID
ไอระเหย Acetaldehyde	Personal Pump SKC No. B12, B45, B49, B51, B55, B59, B61, B70, B77, B82, B84, B85, B86 Rotameter No. L-B03, B10	GC/FID
ระดับเสียงในสถานประกอบการ L_{eq} 8 hr	Acoustic Calibrator Sound Level Meter ACO No. B04, B05, B37, B44 ST-C1 No. B08, B10, B11, B14	-

คุณภาพอากาศในบรรยากาศ



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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	05/05/2026	y = 1.106x-2.614	0.997
B02	B02	06/05/2026	y = 1.113x-1.359	0.997
B03	B03	06/05/2026	y = 1.121x-2.504	0.996
B04	B04	05/05/2026	y = 1.099x-1.383	0.997
B05	B05	05/05/2026	y = 1.103x-2.160	0.998
B06	B06	06/05/2026	y = 1.104x-2.338	0.998
B07	B07	05/05/2026	y = 1.110x-1.779	0.997
B08	B08	06/05/2026	y = 1.117x-0.069	0.998
B09	B09	06/05/2026	y = 1.131x+0.633	0.997
B10	B10	06/05/2026	y = 1.109x-1.997	0.996
B11	B11	05/05/2026	y = 1.113x-0.879	0.998
B12	B12	05/05/2026	y = 1.133x-2.636	0.999
B13	B13	06/05/2026	y = 1.121x-1.555	0.996
B14	B14	05/05/2026	y = 1.114x-0.668	0.996
B15	B15	06/05/2026	y = 1.115x-2.223	0.998
B16	B16	06/05/2026	y = 1.119x-1.715	0.996
B17	B17	06/05/2026	y = 1.128x-2.077	0.999
B18	B18	06/05/2026	y = 1.124x-2.201	0.997
B19	B19	06/05/2026	y = 1.126x-2.072	0.998
B20	B20	05/05/2026	y = 1.128x-1.147	0.998
B21	B21	05/05/2026	y = 1.125x-1.507	0.997
B22	B22	06/05/2026	y = 1.129x-3.099	0.998
B23	B23	05/05/2026	y = 1.136x-3.514	0.996
B24	B24	05/05/2026	y = 1.123x-2.620	0.999
B25	B25	07/05/2026	Y = 1.127x-2.205	0.999
B26	B26	06/05/2026	y = 1.101x-1.346	0.997
B27	B27	06/05/2026	y = 1.120x-2.554	0.996
B28	B28	06/05/2026	y = 1.129x-3.221	0.998
B29	B29	06/05/2026	y = 1.123x-2.970	0.996
B30	B30	06/05/2026	y = 1.126x-1.987	0.996
B31	B31	06/05/2026	y = 1.105x-1.053	0.997
B32	B32	05/05/2026	y = 1.118x-2.347	0.998
B33	B33	06/05/2026	y = 1.129x-1.842	0.996
B34	B34	06/05/2026	y = 1.119x-1.939	0.999



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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	06/05/2026	$y = 1.130x - 2.698$	0.999
B36	B36	05/05/2026	$y = 1.112x - 2.644$	0.998
B37	B37	05/05/2026	$y = 1.124x - 2.608$	0.996
B38	B38	06/05/2026	$y = 1.139x - 1.817$	0.999
B39	B39	05/05/2026	$y = 1.099x + 0.749$	0.997
B40	B40	05/05/2026	$y = 1.135x - 2.517$	0.997
B41	B41	06/05/2026	$y = 1.103x - 0.803$	0.998
B42	B42	05/05/2026	$y = 1.138x - 3.754$	0.999
B43	B43	06/05/2026	$y = 1.132x - 2.425$	0.997
B44	B44	06/05/2026	$y = 1.128x - 2.443$	0.998
R01	R01	07/05/2026	$y = 1.103x - 2.879$	0.997
R02	R02	02/05/2026	$y = 1.130x - 2.934$	0.997
R03	R03	05/05/2026	$y = 1.124x - 2.685$	0.996
R04	R04	05/05/2026	$y = 1.114x - 0.914$	0.998
R05	R05	06/05/2026	$y = 1.059x + 0.368$	0.998
R06	R06	06/05/2026	$y = 1.088x + 0.020$	0.996
R07	R07	06/05/2026	$y = 1.122x - 2.809$	0.996
R08	R08	05/05/2026	$y = 1.101x - 1.418$	0.999
R09	R09	05/05/2026	$y = 1.084x + 0.212$	0.997
R10	R10	05/05/2026	$y = 1.104x - 2.080$	0.998
R11	R11	06/05/2026	$y = 1.112x - 2.545$	0.999
R12	R12	05/05/2026	$y = 1.119x - 0.906$	0.997
R13	R13	05/05/2026	$y = 1.116x - 3.391$	0.997
R14	R14	02/05/2026	$y = 1.080x - 1.101$	0.996
R15	R15	06/05/2026	$y = 1.095x - 0.708$	0.998
R16	R16	02/05/2026	$y = 1.104x - 1.452$	0.997
R17	R17	06/05/2026	$y = 1.102x - 1.932$	0.998
R18	R18	02/05/2026	$y = 1.128x - 4.180$	0.997
R19	R19	02/05/2026	$y = 1.090x - 3.037$	0.996
R20	R20	06/05/2026	$y = 1.130x - 2.859$	0.999



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Gas Sampler Box Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Dry Cal DCL-ML

S/N : 136164

Calibration Data

Gas Sampler		Calibration Data					
No.	Rotameter	Date	Setting (Constant Flow) (mL/min)	Actual Flow Rate (mL/min)			
				Sampling Line A		Sampling Line B	
				Normal Condition	Standard Condition	Normal Condition	Standard Condition
B01	2 (A&B)	02/03/2026	200	200.6	200.7	200.3	200.4
B02	2 (A&B)	02/03/2026	200	200.4	200.5	200.6	200.7
B03	2 (A&B)	04/03/2026	200	200.3	200.4	200.1	200.2
B04	2 (A&B)	04/03/2026	200	200.4	200.5	200.7	200.8
B05	2 (A&B)	02/03/2026	200	200.2	200.3	200.5	200.6
B06	2 (A&B)	02/03/2026	200	200.4	200.5	200.1	200.2
B07	2 (A&B)	05/03/2026	200	199.8	199.9	200.3	200.4
B08	2 (A&B)	05/03/2026	200	200.2	200.3	200.6	200.7
B09	2 (A&B)	02/03/2026	200	200.6	200.7	200.4	200.5
B10	2 (A&B)	02/03/2026	200	200.5	200.6	200.7	200.8
B11	2 (A&B)	02/03/2026	200	200.3	200.4	199.8	199.9
B12	2 (A&B)	02/03/2026	200	200.4	200.5	200.1	200.2
B13	2 (A&B)	05/03/2026	200	200.2	200.3	200.5	200.6
B14	2 (A&B)	05/03/2026	200	200.4	200.5	200.7	200.8
B15	2 (A&B)	05/03/2026	200	200.5	200.6	200.2	200.3
B16	2 (A&B)	04/03/2026	200	200.2	200.3	200.6	200.7
B17	2 (A&B)	04/03/2026	200	200.1	200.2	200.4	200.5



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 17 May 2026

BRAND : API

MODEL : 200E

NO. NOX-B08

SERIAL NO. 4336

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	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.010
NO _x Span	400	400.2	0.050	400.0	1.013

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	504	cc/min	500 ± 50
OZONE FLOW	78	cc/min	80 ± 15
PMT	103.0	mV	-20 - 150
AZERO	93.7	mV	-20 - 150
HVPS	671	V	420 - 900 constant
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.2	°C	8 - 48
PMT TEMP	7.1	°C	7 ± 2
MOLY TEMP	315.2	°C	315 ± 5
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant
SAMPLE PRESS	28.5	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	1.010	-	1.0 ± 0.3
NO _x Slope	1.013	-	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



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	17 May 2026	BRAND :	API	MODEL :	200A
NO.	NOX-B15	SERIAL NO.	213		
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	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
NO Span	400	399.8	-0.050	400.0	1.008
NO _x Span	400	400.2	0.050	400.0	1.012
API Model 200A 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	508	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.3	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	672	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.3	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	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	1.008	-	1.0 ± 0.3		
NO _x Slope	1.012	-	1.0 ± 0.3		
NO Offset	1.4	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		



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CALIBRATION REPORT

CHEMILUMINESCENT NO / NO₂ / NO_x ANALYZER

DATE : 17 May 2026

BRAND : API

MODEL : TML-41M

NO. NOX-B20

SERIAL NO. N02782

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	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.007
NO _x Span	400	400.1	0.025	400.0	1.010

API Model TML-41M 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	674	V	420 - 900 constant
RCELL TEMP	50.2	°C	50 ± 1
BOX TEMP	29.1	°C	8 - 48
PMT TEMP	7.4	°C	7 ± 2
MOLY TEMP	314.8	°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	1.007	-	1.0 ± 0.3
NO _x Slope	1.010	-	1.0 ± 0.3
NO Offset	1.2	mV	-20 to +150
NO _x Offset	0.8	mV	-20 to 150
Stability at Zero	0.1	PPB	< 0.2
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Page 1 of 3

Certificate No. : L202511307-0001

Date Issued : 01-Dec-25

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

Equipment : Mass Flow meter

Manufacturer : Dwyer

Model : GMF-2101

Serial No. : -

ID No./Tag No. : MF01/51

Date Received : 27-Nov-25

Date Calibrated : 30-Nov-25

Calibrated by : Nattawat Laochai

Calibration Method or Calibration Procedure Used

In-house method : CP-34 by comparison against mass flow calibrator.

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

Result of Calibration

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

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

Approved by:



Certificate No. : L202511307-0001

Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$ Relative Humidity : $(50 \pm 15)\%\text{RH}$

Capacity Range : 17 ml/min

Calibration Media : Nitrogen

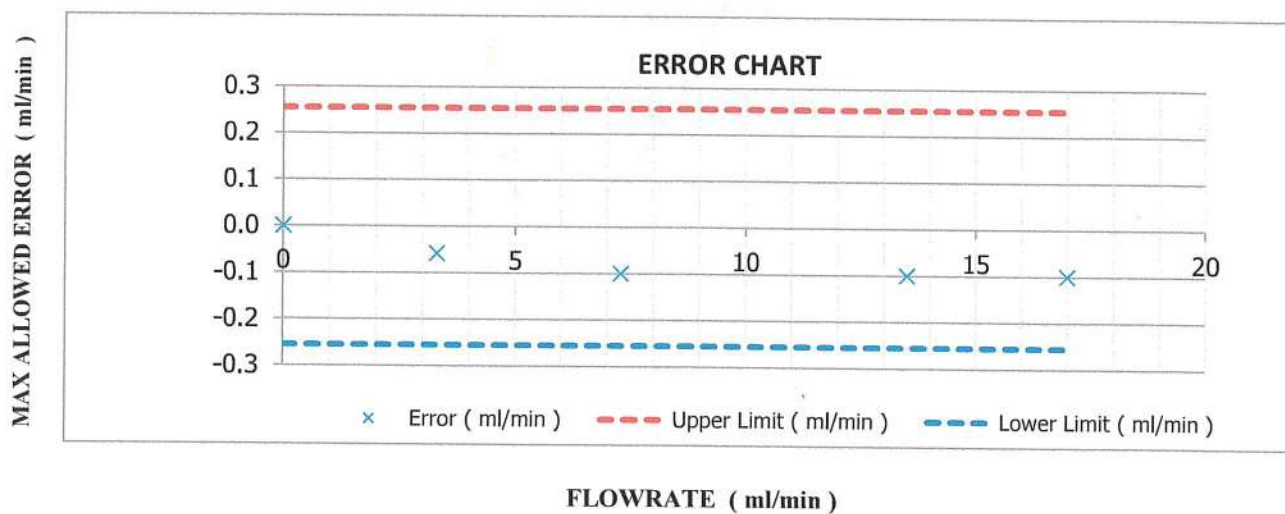
Type : Mass Flowmeter

Unit Under Calibration Reference Condition : Pressure 101.325 kPa(abs) , 21 °C , Nitrogen

Temperature (° C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)
24.69	101.22	0.00	0.000 *	0.000	0.063
24.44	119.03	3.30	3.358	-0.058	0.14
24.38	118.17	7.30	7.4	-0.10	0.15
24.30	156.08	13.50	13.6	-0.10	0.15
24.25	169.92	17.00	17.1	-0.10	0.18

Error = Unit Under Calibration - Standard

Marked * are not included in the NSC-ONSC accreditation schedule for our laboratory.



Certificate No. : L202511307-0001

Note : The actual flow rate is determined by the equation :

$$Q_{Meas} = Q_{Ref} \times \frac{P_{Ref}}{P_{Meas}} \times \frac{T_{Meas}}{T_{Ref}}$$

; Q = Flow rate

; P = Absolute pressure

; T = Absolute temperature

; Subscript "Meas" = Measurement condition

; Subscript "Ref" = Reference condition

Condition As-Received : Used Item

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

Traceability of Certificate :

The International System of Units (SI) through

NIMT Calibration Certificate No. MW-0047-24 for Gas Flow meter Serial No. M5209179B/M5209179A, Due 28-Jun-26

NIMT Calibration Certificate No. MW-0048-24 for Gas Flow meter Serial No. M5209179C/M5209179A, Due 02-Jul-26

End of Certificate



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 : 

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

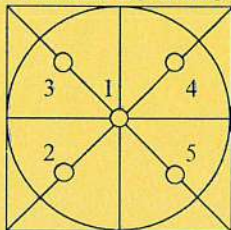
2. TARE FUNCTION : NORMAL

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

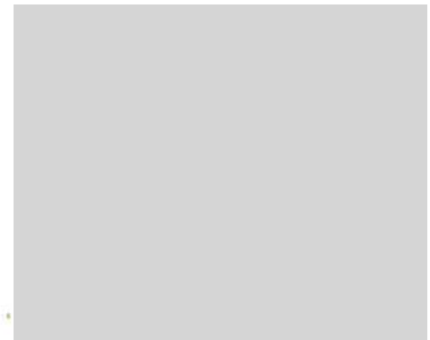
Pages : 1 of 4

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 $\pm$ 5) °C
Relative Humidity :	(53.7 $\pm$ 25) %
Received Date :	22 AUGUST 2025
Calibration Date :	22 AUGUST 2025
Date of Issue :	25 AUGUST 2025

Calibrated by :

Approved by :



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

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)

คุณภาพอากาศจากปล่องระบาย



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

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_{g} (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_{g} (test) is 46.7 ± 6.4 (mmH₂O)



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

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	05/05/2026	0.84	0.83
B04	S	0.99	05/05/2026	0.84	0.85
B05	S	0.99	05/05/2026	0.84	0.83
B07	S	0.99	05/05/2026	0.84	0.84
B08	S	0.99	05/05/2025	0.84	0.84
B09	S	0.99	05/05/2026	0.85	0.84
B11	S	0.99	05/05/2026	0.84	0.84
B16	S	0.99	06/05/2026	0.84	0.84
B18	S	0.99	06/05/2026	0.85	0.84
B19	S	0.99	06/05/2025	0.84	0.85
B21	S	0.99	05/05/2026	0.84	0.84
B24	S	0.99	05/05/2026	0.84	0.85
B27	S	0.99	05/05/2026	0.85	0.84
B30	S	0.99	05/05/2026	0.84	0.85
B31	S	0.99	05/05/2026	0.83	0.84
B33	S	0.99	05/05/2026	0.84	0.84
B35	S	0.99	03/05/2026	0.84	0.85

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



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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

Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

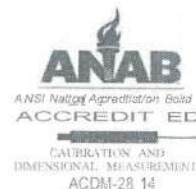
Calibration Data					
Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	05/05/2026	0.84	0.84
B37	S	0.99	03/05/2026	0.84	0.85
B38	S	0.99	03/05/2026	0.84	0.84
B39	S	0.99	06/05/2026	0.84	0.85
B40	S	0.99	06/05/2026	0.85	0.84
B41	S	0.99	05/05/2026	0.84	0.85
B44	S	0.99	06/05/2026	0.84	0.83
B45	S	0.99	05/05/2026	0.84	0.84
B46	S	0.99	05/05/2026	0.84	0.85
B47	S	0.99	03/05/2026	0.84	0.84
B48	S	0.99	03/05/2026	0.85	0.84
B49	S	0.99	03/05/2026	0.84	0.84
B54	S	0.99	05/05/2026	0.85	0.84
B56	S	0.99	03/05/2026	0.84	0.84
B57	S	0.99	05/05/2026	0.84	0.84
B58	S	0.99	03/05/2026	0.84	0.84

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



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 :

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

F3-011-05/12-23

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

211Q-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-Q353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



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

F3-011-05/12-23

page 2 of 3

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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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



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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



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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
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



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Rotameter Calibration Report (For Personal Pump High 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
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



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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

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)											
Calibration Method : Dry Cal Primary Flowmeter				Model : Defender 510-H				S/N : 136164			
Calibration Data											
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
L-B01	Dwyer	VFA-21	01/04/2026	50	100	200	49.8	100.6	200.9	1.001x + 0.276	1.000
L-B02	Dwyer	VFA-21	01/04/2026	50	100	200	50.7	101.9	201.6	1.000x + 1.270	1.000
L-B03	Dwyer	VFA-21	01/04/2026	50	100	200	50.3	99.8	199.2	1.001x - 0.849	0.999
L-B04	Dwyer	VFA-21	02/04/2026	50	100	200	49.9	98.6	202.5	1.002x - 0.797	0.999
L-B05	Dwyer	VFA-21	02/04/2026	50	100	200	50.8	99.7	201.4	0.999x + 0.452	1.000
L-B06	Dwyer	VFA-21	02/04/2026	50	100	200	50.7	101.9	199.3	1.000x + 0.872	1.000
L-B07	Dwyer	VFA-21	01/04/2026	50	100	200	50.8	99.1	202.9	0.999x + 0.048	0.999
L-B08	Dwyer	VFA-21	01/04/2026	50	100	200	50.6	100.1	198.7	0.997x + 0.447	1.000
L-B09	Dwyer	VFA-21	06/04/2026	50	100	200	50.2	100.8	200.7	1.000x + 0.515	1.000
L-B10	Dwyer	VFA-21	06/04/2026	50	100	200	50.1	99.5	201.1	1.001x - 0.608	0.999



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 :



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

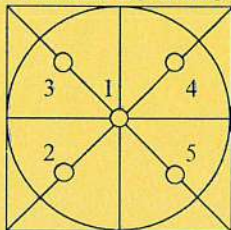
2. TARE FUNCTION : NORMAL

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

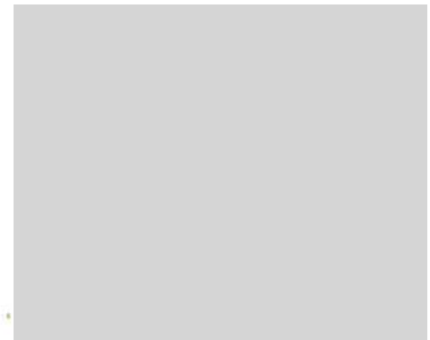
Pages : 1 of 4

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 :

Approved by :



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



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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

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	05 May 2026	Brand :	API	Model :	300EU
No.	CO-B14			Serial No.	131
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	40.06	0.150	40.00	
API Model 300EU 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	4017.1	mV	2500-4800 mV		
CO Reference	3948.9	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	804	CC/Min	800 ± 10%		
Sample Temperature	48.5	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.4	°C	68 ± 2		
Box Temperature	30.9	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3037.6	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		



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

Calibration Report

Photo-Ionization Detector VOC Analyzer

Date : 05 May 2026

Brand : Mini RAE System

Model : Mini RAE 3000

No. B02

Serial No. 592-917802

Reference Standard Gas

Standard Gas : Isobutylene (C_4H_8)

Cylinder No. : 082525CA-C

Certified Date : 26 August 2025

Expired Date : 26 August 2030

Cylinder Conc. : 100 ppm

Calibrating Condition

Pressure 1011 mmbar

Temp. 24.6 °C

% RH 50

Calibration Setting

Span Set Point	Initial Reading (Before Adj.)			Final Reading (After Adj.)
	PPM			PPM
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response
Zero (Fresh Air)	0	0.1	-	0
VOC Span (Isobutylene)	100	99.6	-0.40	100



GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0825/23032

Instrument Type : Gas Chromatography

Model : 3800

Serial Number : 00734

Organization : S.P.S. Consulting Service Co., Ltd.

Address : 7 Phahonyothin Soi 24 Phahonyothin Rd. Ladyao Chatuchak Bangkok 10900

Date : 02/08/2025

ELECTRONIC TEST

CPU	☒ PASS	☐ FAIL
DISPLAY & LED TEST	☒ PASS	☐ FAIL
VENT TEST	☒ PASS	☐ FAIL
KEY ECHO TEST	☒ PASS	☐ FAIL
DESTRUCTION RAM TEST	☒ PASS	☐ FAIL

RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detectors (FID Channel-Front)

INJECTOR : 1079 Injector

GC CONDITION:

Column	80 °C hold 1 min., rate 20 °C/min. to 200 °C hold 1min.
Injector	220 °C
Detector	300 °C
Column flow	5 mL/min
Makeup flow	25 mL/min
Air flow	300 mL/min
Hydrogen flow	30 mL/min

Column: Capillary Column CP sil 5 CB 0.25 ID x 15 M

Sample: 1 µL Injection FID Test Sample 0.218g/L C14,C15,C16 in hexane (diluted to 30ppm)

SENSITIVITY TEST: C15. (Area count) = 515,940 Counts.





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THAI UNIQUE CO., LTD.

80-82 ถนนประชาทิพย์ไทย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thuwatt@thaiunique.com, Website : www.thaiunique.com

Detector Sensitivity (FID)

Detector Response	Result	Specification
Baseline Noise (μV)	2.40	≤ 50
Baseline Drift (%)	0.18	≤ 1
Sensitivity (S/N for C15)	19,716	$\geq 1,024$

Temperature Specification

Temperature	Set	Result	Specification
Column Oven ($^{\circ}C$)	80	79	± 5
Injector ($^{\circ}C$)	220	218	± 5
Detector ($^{\circ}C$)	300	298	± 5
Incubator ($^{\circ}C$)	60	N/A	± 5

Relative Standard Deviation % (%RSD)

Checkout Procedure	Result	Specification
Area C15 (%)	1.48	≤ 5
Retention Time C15 (%)	0.08	≤ 0.5

APPROVAT -

Engineer : Somchai Pohtongkam

Date : 02/08/2025



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THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 Area 1	506,043
C15 Area 2	520,497
C15 Area 3	522,154
C15 Area 4	521,664
C15 Area 5	509,340
C15 Area Average	515,940
* % RSD (< 5 %)	1.48

* The precision specification should be less than 2.0 % RSD ** (Relative Standard Deviation) for an Auto sampler injection and less than 5 % for Manual injections. To calculate the %RSD, select the C15 peak area for each of the five (5) samples.

** (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = (\text{std.dev} / \text{avg}) * 100$$

Compliance	☒ Pass	☐ Fail
Performance by		
Date	02/08/2025	



Comments			
Reviewed by			Date 02/08/2025



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THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 RT 1	3.874
C15 RT 2	3.880
C15 RT 3	3.875
C15 RT 4	3.872
C15 RT 5	3.878
C15 RT Average	3.876
* % RSD (< 0.5 %)	0.08

* The precision specification should be less than 0.5 % RSD ** (Relative Standard Deviation) for an Auto sampler injection and less than 0.5 % for Manual injections. To calculate the %RSD, select the RT C15 peak for each of the five (5) samples.

** (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = (\text{std.dev} / \text{avg}) * 100$$

Compliance	☒ Pass	☐ Fail
Performance by		
Date	02/08/2025	



Comments			
Reviewed by			Date 02/08/2025



VARIAN

ระดับเสียงในบรรยากาศ



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

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 :



Approved by :



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

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FM.BL.MTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, Changwat Pathumthani 12120, Thailand
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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_299/26

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-C1-B03	ACO	6238	00223040	18 May 2026	93.8	93.9
ST-C1-B09	SCARLET	ST-12D	10351478	18 May 2026	93.7	93.9
ST-C1-B18	SCARLET	ST-12D	10352316	18 May 2026	93.9	93.9
ST-C1-B20	SCARLET	ST-12D	10352322	18 May 2026	93.9	93.9
ST-C1-B24	SCARLET	ST-12D	10352330	18 May 2026	93.8	93.9
ST-C1-B27	SCARLET	ST-12D	10352334	18 May 2026	93.7	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	

คุณภาพน้ำ



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 :

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



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



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.

Certificate No. **Q25070523**

F3-011-05/12-23

page 2 of 4



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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



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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



QUALITY CALIBRATION CO., LTD.

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



CERTIFICATE No : 26E3363
REFERENCE No : 80514-1

PAGE : 1 OF 3

Certificate of Calibration

EQUIPMENT : pH METER
MANUFACTURER : HANNA
MODEL : HI3512
SERIAL No : TH118035
ID No : PH 04/56
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : ATSAWIN Y.

CALIBRATION DATE : 02-Apr-26

APPROVED BY :



ISSUED DATE : 02-Apr-26

RECEIVED DATE : 01-Apr-26

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



**QUALITY CALIBRATION CO., LTD.**

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

CERTIFICATE No : 26E3363

PAGE : 2 OF 3

Calibration Report

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

CONDITION OF THIS RESULTS OF CALIBRATION

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

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

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO SI UNIT MAINTAINED AT :-

- NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY, USA.
- NATIONAL INSTUTITE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION : ADJUSTMENT**1. DISPLAY UNIT ONLY**SLOPE FACTOR $k = 2.303 RT/F = 59 \text{ mV/pH}$

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

END OF CALIBRATION REPORT PAGE 2 OF 3





QUALITY CALIBRATION CO., LTD.

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Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 26E3363

PAGE : 3 OF 3

Calibration Report

RESULT OF CALIBRATION (CONTINUE) :

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

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

3. DISPLAY UNIT WITH TEMPERATURE

STANDARD READING ($^{\circ}$ C)	UUC READING ($^{\circ}$ C)	CORRECTION ($^{\circ}$ C)	VALUE BEFORE ADJUSTMENT	UNCERTAINTY OF MEASUREMENT ($\pm$ $^{\circ}$ C)	COVERAGE FACTOR k
25.004	25.0	0.004	---	0.0085	2.00

4. PERCENT SLOPE 91%

UUC : UNIT UNDER CALIBRATION

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

END OF CALIBRATION REPORT



Certificate of Calibration

Certificate No. : 69-400023-2

Page : 1 of 2

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

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

Equipment : Liquid in Glass Thermometer

Manufacturer : SK

Model : N/A

Range : 0 °C to 100 °C

Resolution : 1 °C

Serial No. : N/A

Immersion : Total

ID No. : TM21/59

Environment : Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received : 13 January 2026

Date of Calibration : 16 January 2026

Date of Issue : 16 January 2026

Calibrated by : Chortip Samchusri

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

The temperature scale used was based on ITS-90

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

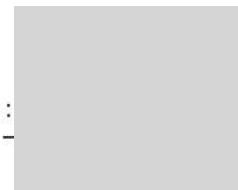
1. Platinum Resistance Thermometer (PRT)

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

2. Standard Digital Thermometer

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

Approved by :



Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 69-400023-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

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

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

Remark

UUC : Unit Under Calibration

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

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

- 000 -





CERTIFICATE No : 25M2256

REFERENCE No : 76365-3

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE

MANUFACTURER : SARTORIUS

MODEL : BSA224S-CW

SERIAL No : 36591843

ID No : BA09/61

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 : ATSAWIN Y.

CALIBRATION DATE : 07-Mar-25

APPROVED BY : 

ISSUED DATE : 13-Mar-25

RECEIVED DATE : 07-Mar-25

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QUALITY CALIBRATION CO., LTD.





CERTIFICATE No : 25M2256

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW
MANUFACTURER : SARTORIUS S/N : 36591843
ID No : BA09/61 RECEIVED DATE : 07-Mar-25
AIR PRESSURE : 1009mbar $\pm$ 1mbar CALIBRATION DATE : 07-Mar-25
AMBIENT TEMPERATURE : 24° C $\pm$ 1° C RELATIVE HUMIDITY : 52 %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

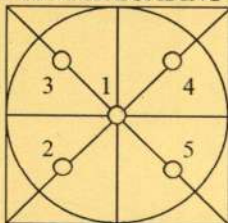
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ($\pm$ g)
0.00	0.0000	0.0000	0.00012
0.10	0.1000	0.0000	0.00012
0.20	0.2000	0.0000	0.00012
0.50	0.5000	0.0000	0.00012
1.00	1.0000	0.0000	0.00012
2.00	2.0000	0.0000	0.00012
5.00	5.0000	0.0000	0.00012
10.00	10.0000	0.0000	0.00012
20.00	20.0001	-0.0001	0.00012
50.00	50.0000	0.0000	0.00014
100.00	100.0001	-0.0001	0.00019
200.00	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





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

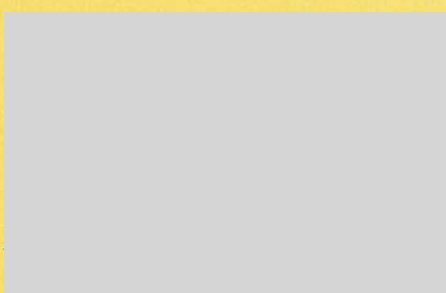
ID No : BA 09/61

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

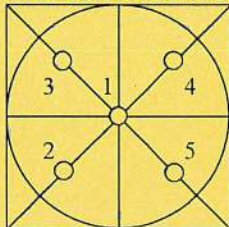
2. TARE FUNCTION : NORMAL

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-W015C

Calibration Date : 18 Mar 25
 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)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.07	(PASS)	-
Measurement 5 (mg/l)	9.07	(PASS)	-
Measurement 6 (mg/l)	9.07	(PASS)	-
Measurement 7 (mg/l)	9.07	(PASS)	-
Measurement 8 (mg/l)	9.07	(PASS)	-
Measurement 9 (mg/l)	9.07	(PASS)	-
Measurement 10 (mg/l)	9.07	(PASS)	-

Mean Measurement	9.07	mg/l	-	-
Inaccuracy	0.02	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.

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.



QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

www.qcalibration.com

CERTIFICATE No : 25T0520

REFERENCE No : 75853-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0497

ID No : DRB 05/59

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 : CHAICHARN CH.

CALIBRATION DATE : 27-Jan-25

APPROVED BY :

ISSUED DATE : 27-Jan-25

RECEIVED DATE : 15-Jan-25





QUALITY CALIBRATION CO., LTD.

235 Petchkasem 63/2 Road, Laksong, Bangkae, Bangkok 10160

Tel (662) 421-5402, (662) 444-0152-3, Fax (662) 809-4584

CERTIFICATE No : 25T0520

PAGE : 2 OF 2

Calibration Report

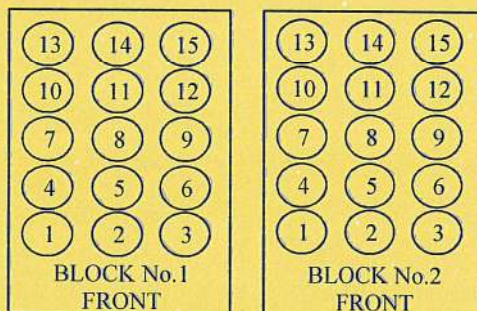
EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : DRB 05/59
RECEIVED DATE : 15-Jan-25
AMBIENT TEMPERATURE : 23° C ± 1° C
MODEL : DRB 200
SERIAL NUMBER : 15110C0497
CALIBRATION DATE : 27-Jan-25
RELATIVE HUMIDITY : 53 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	6635300	24T6468	26-Jun-25
3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



Block No.	1	2
Calibration Point (°C)	150	150
Controller temperature (°C)	144	144
Indicating Temperature	144	144
Measured Temperature (°C) at Spread Locations	1	150.01
	2	150.69
	3	150.40
	4	150.22
	5	150.27
	6	150.51
	7	150.24
	8	150.20
	9	150.14
	10	149.70
	11	149.58
	12	149.46
	13	148.77
	14	148.99
	15	149.02
Uncertainty of Measurement(± °C)	0.87	0.87

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAM

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY
COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT





CERTIFICATE No : 26T0464

REFERENCE No : 79659-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : COD REACTOR

MANUFACTURER : HACH

MODEL : DRB 200

SERIAL No : 15110C0497

ID No : DRB 04/59

SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : SOMCHAI S.

CALIBRATION DATE : 30-Jan-26

APPROVED BY :

ISSUED DATE : 30-Jan-26

RECEIVED DATE : 30-Jan-26





CERTIFICATE No : 26T0464

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : COD REACTOR
MANUFACTURER : HACH
ID NUMBER : DRB 04/59
RECEIVED DATE : 30-Jan-26
AMBIENT TEMPERATURE : 23° C ± 1° C

MODEL : DRB 200
SERIAL NUMBER : 15110C0497
CALIBRATION DATE : 30-Jan-26
RELATIVE HUMIDITY : 54 %RH ± 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE.

2. REFERENCE STANDARD INSTRUMENTS :-

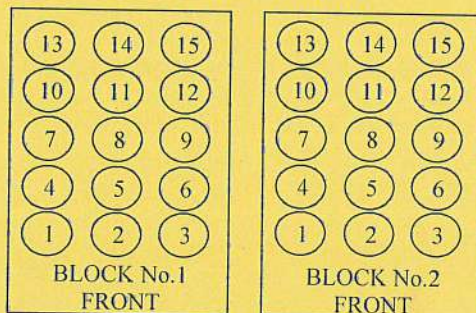
INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	6849323	25T5342	18-Jun-26

3. THE CERTIFICATE IS VALID FOR THE ITEM CALIBRATED AS SHOWN ON THE DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH QUALITY CALIBRATION CO., LTD.

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT



TEMPERATURE MEASUREMENT ACCURACY TEST

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

NOTE 1 : THE UNCERTAINTY OF MEASUREMENT EXCLUDED TEMPERATURE UNIFORMITY OF THE CHAMBER.

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



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	05/01/2026	1,000	1,500	2,000	1,004	1,501	2,003	1.010x - 18.941	0.999
B02	SKC	224-PCXR4	626166	05/01/2026	1,000	1,500	2,000	1,000	1,500	2,002	1.012x - 23.432	0.999
B03	SKC	224-PCXR4	612968	05/01/2026	1,000	1,500	2,000	993	1,503	2,001	1.008x - 15.587	1.000
B04	SKC	224-PCXR4	602804	06/01/2026	1,000	1,500	2,000	1,001	1,498	1,996	0.997x + 2.672	1.000
B05	SKC	224-PCXR4	612693	07/01/2026	1,000	1,500	2,000	999	1,494	1,993	0.995x + 1.555	1.000
B06	SKC	224-PCXR4	262188	06/01/2026	1,000	1,500	2,000	1,002	1,501	2,004	1.007x - 12.528	1.000
B07	SKC	224-PCXR4	626262	06/01/2026	1,000	1,500	2,000	1,003	1,501	2,002	1.010x - 19.021	0.999
B08	SKC	224-PCXR4	626100	06/01/2026	1,000	1,500	2,000	1,005	1,500	2,006	1.006x - 8.619	1.000
B09	SKC	224-PCXR4	626479	05/01/2026	1,000	1,500	2,000	1,001	1,500	2,000	1.007x - 14.458	1.000
B10	SKC	224-PCXR4	091950	05/01/2026	1,000	1,500	2,000	998	1,503	2,000	1.001x - 5.945	1.000
B11	SKC	224-PCXR8	564315	05/01/2026	1,000	1,500	2,000	993	1,494	1,993	1.010x - 25.765	0.999
B12	SKC	224-PCXR4	034656	05/01/2026	1,000	1,500	2,000	995	1,497	1,998	0.996x - 4.790	0.999
B13	SKC	224-PCXR4	602073	05/01/2026	1,000	1,500	2,000	994	1,499	1,975	0.990x + 6.525	0.999
B14	SKC	224-PCXR4	626313	05/01/2026	1,000	1,500	2,000	993	1,499	1,994	1.001x - 7.291	1.000
B15	SKC	224-PCXR4	626474	05/01/2026	1,000	1,500	2,000	992	1,505	2,002	1.012x - 23.464	1.000
B16	SKC	224-PCXR4	626477	06/01/2026	1,000	1,500	2,000	993	1,496	1,991	0.996x + 0.945	1.000
B17	SKC	224-PCXR4	626860	06/01/2026	1,000	1,500	2,000	1,000	1,500	2,001	1.007x - 14.414	1.000
B18	SKC	224-PCXR4	691484	05/01/2026	1,000	1,500	2,000	994	1,502	2,002	1.015x - 30.763	0.999
B19	SKC	224-PCXR4	691599	05/01/2026	1,000	1,500	2,000	993	1,490	1,999	1.006x - 14.713	1.000
B20	SKC	224-PCXR4	691587	05/01/2026	1,000	1,500	2,000	991	1,500	1,997	1.005x - 13.565	1.000
B21	SKC	224-PCXR4	691531	05/01/2026	1,000	1,500	2,000	1,002	1,500	2,000	1.002x - 6.050	1.000
B22	SKC	224-PCXR4	691654	05/01/2026	1,000	1,500	2,000	1,008	1,498	1,995	1.000x - 6.158	0.999
B23	SKC	224-PCXR4	798393	06/01/2026	1,000	1,500	2,000	992	1,498	1,972	0.990x + 3.813	0.999
B24	SKC	224-PCXR4	626363	06/01/2026	1,000	1,500	2,000	1,003	1,493	2,002	1.001x - 5.201	1.000
B25	SKC	224-PCXR4	798489	06/01/2026	1,000	1,500	2,000	993	1,496	1,995	1.003x - 10.857	1.000
B26	SKC	224-PCXR4	798479	06/01/2026	1,000	1,500	2,000	994	1,505	2,002	1.012x - 23.253	1.000
B27	SKC	224-PCXR4	691673	06/01/2026	1,000	1,500	2,000	996	1,506	1,989	0.994x + 5.799	1.000
B28	SKC	224-PCXR4	691570	06/01/2026	1,000	1,500	2,000	995	1,502	1,998	0.999x - 5.193	1.000
B29	SKC	224-PCXR4	626472	05/01/2026	1,000	1,500	2,000	995	1,491	1,993	0.999x - 4.662	1.000
B30	SKC	224-PCXR4	691489	05/01/2026	1,000	1,500	2,000	1,003	1,500	1,998	1.002x - 6.804	1.000
B31	SKC	224-PCXR4	691509	05/01/2026	1,000	1,500	2,000	993	1,500	1,997	0.992x + 4.256	1.000
B32	SKC	224-PCXR4	091567	05/01/2026	1,000	1,500	2,000	994	1,487	1,972	0.990x - 2.389	0.999
B33	SKC	224-PCXR4	091756	05/01/2026	1,000	1,500	2,000	993	1,496	1,998	1.013x - 28.816	0.999
B34	SKC	224-PCXR4	612962	05/01/2026	1,000	1,500	2,000	994	1,502	2,003	1.011x - 21.717	1.000
B35	SKC	224-PCXR4	602682	06/01/2026	1,000	1,500	2,000	998	1,493	2,000	1.001x - 2.561	1.000
B36	SKC	224-PCXR4	626164	06/01/2026	1,000	1,500	2,000	993	1,497	1,994	1.003x - 8.755	1.000
B37	SKC	224-PCXR4	626256	06/01/2026	1,000	1,500	2,000	993	1,508	2,007	1.009x - 10.996	1.000
B38	SKC	224-PCXR4	626167	06/01/2026	1,000	1,500	2,000	993	1,502	2,000	1.013x - 28.162	0.999
B39	SKC	224-PCXR4	034637	06/01/2026	1,000	1,500	2,000	1,000	1,497	1,993	0.991x + 9.544	1.000
B40	SKC	224-PCXR4	798349	06/01/2026	1,000	1,500	2,000	1,000	1,499	1,994	0.998x - 0.160	1.000



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
B41	SKC	224-PCXR4	612669	05/01/2026	1,000	1,500	2,000	995	1,490	1,997	1.004x - 11.846	1.000
B42	SKC	224-PCXR4	626041	05/01/2026	1,000	1,500	2,000	996	1,510	1,999	0.999x - 0.630	1.000
B43	SKC	224-PCXR4	034636	05/01/2026	1,000	1,500	2,000	1,000	1,493	2,004	1.004x - 6.760	1.000
B44	SKC	224-PCXR8	529341	05/01/2026	1,000	1,500	2,000	995	1,512	1,995	1.000x - 4.571	0.999
B45	SKC	224-PCXR8	529594	05/01/2026	1,000	1,500	2,000	997	1,503	2,001	1.004x - 10.178	1.000
B46	SKC	224-PCXR8	566743	05/01/2026	1,000	1,500	2,000	997	1,491	2,007	1.013x - 21.797	1.000
B47	SKC	224-PCXR8	566747	06/01/2026	1,000	1,500	2,000	995	1,508	1,999	1.007x - 15.240	0.999
B48	SKC	224-PCXR8	566753	06/01/2026	1,000	1,500	2,000	998	1,493	1,992	0.997x - 0.746	1.000
B49	SKC	224-PCXR8	566780	06/01/2026	1,000	1,500	2,000	994	1,475	1,991	1.002x - 18.905	0.999
B50	SKC	224-PCXR8	500400	06/01/2026	1,000	1,500	2,000	990	1,498	1,992	0.991x + 4.770	0.999
B51	SKC	224-PCXR8	500363	06/01/2026	1,000	1,500	2,000	995	1,498	1,994	1.008x - 21.051	0.999
B52	SKC	224-PCXR8	093186	06/01/2026	1,000	1,500	2,000	1,001	1,494	1,995	0.993x + 6.362	1.000
B53	SKC	224-PCXR8	707670	06/01/2026	1,000	1,500	2,000	992	1,502	2,007	1.016x - 28.087	1.000
B54	SKC	224-PCXR3	509821	06/01/2026	1,000	1,500	2,000	1,000	1,497	2,002	1.009x - 18.056	1.000
B55	SKC	224-PCXR3	510710	05/01/2026	1,000	1,500	2,000	999	1,497	2,001	1.008x - 15.994	1.000
B56	SKC	224-PCXR3	511450	05/01/2026	1,000	1,500	2,000	996	1,510	2,001	1.005x - 11.080	0.999
B57	SKC	224-PCXR3	510798	05/01/2026	1,000	1,500	2,000	1,000	1,493	2,001	1.000x - 1.575	1.000
B58	SKC	224-PCXR3	509852	05/01/2026	1,000	1,500	2,000	997	1,473	1,995	1.000x - 11.132	0.999
B59	SKC	224-PCXR3	509862	05/01/2026	1,000	1,500	2,000	961	1,461	1,969	1.021x - 71.317	0.999
B60	SKC	224-PCXR3	512655	06/01/2026	1,000	1,500	2,000	971	1,469	2,001	1.027x - 56.285	0.999
B61	SKC	224-PCXR3	503915	06/01/2026	1,000	1,500	2,000	1,000	1,476	2,001	1.006x - 16.496	0.999
B62	SKC	224-PCXR3	505975	06/01/2026	1,000	1,500	2,000	997	1,503	2,001	1.004x - 10.186	1.000
B63	SKC	224-PCXR3	511432	06/01/2026	1,000	1,500	2,000	1,000	1,496	1,994	0.996x - 0.574	1.000
B64	SKC	224-PCXR3	508302	06/01/2026	1,000	1,500	2,000	1,000	1,500	1,997	1.000x - 4.850	1.000
B65	SKC	224-PCXR3	508310	05/01/2026	1,000	1,500	2,000	998	1,505	1,999	1.001x - 5.999	1.000
B66	SKC	224-PCXR3	509861	05/01/2026	1,000	1,500	2,000	1,003	1,501	2,006	1.009x - 15.631	0.999
B67	SKC	224-PCXR3	506295	05/01/2026	1,000	1,500	2,000	996	1,496	1,993	0.999x - 4.016	1.000
B68	SKC	224-PCXR3	505872	05/01/2026	1,000	1,500	2,000	1,003	1,491	2,001	0.995x + 5.309	1.000
B69	SKC	224-PCXR3	508375	06/01/2026	1,000	1,500	2,000	994	1,507	2,002	1.008x - 16.847	0.999
B70	SKC	224-PCXR3	510623	06/01/2026	1,000	1,500	2,000	993	1,506	2,003	1.010x - 18.889	1.000
B71	SKC	224-PCXR3	508367	07/01/2026	1,000	1,500	2,000	997	1,501	1,994	0.999x - 0.148	1.000
B72	SKC	224-PCXR3	505977	06/01/2026	1,000	1,500	2,000	1,000	1,503	2,003	1.004x - 8.252	1.000
B73	SKC	224-PCXR3	512606	06/01/2026	1,000	1,500	2,000	996	1,495	1,995	0.998x - 1.627	1.000
B74	SKC	224-PCXR3	505993	06/01/2026	1,000	1,500	2,000	995	1,506	1,999	1.008x - 17.629	0.999
B75	SKC	224-PCXR3	509820	05/01/2026	1,000	1,500	2,000	997	1,491	1,999	1.001x - 6.461	1.000
B76	SKC	224-PCXR3	509811	05/01/2026	1,000	1,500	2,000	1,000	1,472	2,004	1.008x - 18.391	1.000
B77	SKC	224-PCXR3	508301	05/01/2026	1,000	1,500	2,000	993	1,471	1,995	1.000x - 10.813	0.999
B78	SKC	224-PCXR3	510677	05/01/2026	1,000	1,500	2,000	999	1,477	2,000	1.003x - 12.304	0.999
B79	SKC	224-PCXR3	510920	06/01/2026	1,000	1,500	2,000	1,001	1,500	1,997	0.998x + 0.215	1.000



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7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

Temperature : 25 ± 3 °C
Pressure : 1010 ± 15 mmbar

Personal Pump Data				Calibration Data								
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	06/01/2026	1,000	1,500	2,000	995	1,499	1,996	0.991x + 5.480	0.999
B81	SKC	224-PCXR3	503480	06/01/2026	1,000	1,500	2,000	1,000	1,474	1,999	1.001x - 10.358	0.999
B82	SKC	224-PCXR3	505673	06/01/2026	1,000	1,500	2,000	1,000	1,474	1,995	0.998x - 6.617	0.999
B83	SKC	224-PCXR3	510785	06/01/2026	1,000	1,500	2,000	1,002	1,503	1,992	0.991x + 10.253	1.000
B84	SKC	224-PCXR3	508333	05/01/2026	1,000	1,500	2,000	994	1,501	1,989	0.997x - 2.939	1.000
B85	SKC	224-PCXR3	505757	05/01/2026	1,000	1,500	2,000	995	1,494	2,006	1.012x - 22.072	0.999
B86	SKC	224-PCXR3	512625	05/01/2026	1,000	1,500	2,000	997	1,507	1,992	0.998x + 11.080	0.999
B87	SKC	224-PCXR3	504324	05/01/2026	1,000	1,500	2,000	994	1,473	1,996	1.000x - 10.529	0.999
B88	SKC	224-PCXR3	508307	05/01/2026	1,000	1,500	2,000	993	1,470	1,989	0.991x - 3.749	0.999
B89	SKC	224-PCXR3	509860	05/01/2026	1,000	1,500	2,000	1,001	1,499	2,005	1.007x - 12.041	1.000
B90	SKC	224-PCXR3	508366	06/01/2026	1,000	1,500	2,000	997	1,494	2,001	1.003x - 8.172	1.000
B91	SKC	224-PCXR3	510919	06/01/2026	1,000	1,500	2,000	995	1,491	1,997	1.004x - 14.630	1.000
B92	SKC	224-PCXR3	510987	06/01/2026	1,000	1,500	2,000	974	1,499	1,995	1.017x - 40.878	0.999
B93	SKC	224-PCXR3	509845	06/01/2026	1,000	1,500	2,000	995	1,493	1,997	0.992x + 3.414	0.999



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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
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



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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



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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

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



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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	05/01/2026	500	1,000	2,000	506.0	991.5	1985.3	0.991x + 9.075	1.000
H-B02	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	496.1	998.2	1994.1	0.994x + 5.436	1.000
H-B03	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	499.0	987.7	2010.2	1.004x - 13.828	0.999
H-B04	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	505.4	999.9	2008.7	0.997x + 2.196	1.000
H-B05	Dwyer	VFB-65	07/01/2026	500	1,000	2,000	494.6	997.4	1987.1	0.990x + 10.392	1.000
H-B06	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	504.3	993.8	1981.8	1.005x - 9.139	0.999
H-B07	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	504.1	996.5	2018.3	1.001x - 0.092	1.000
H-B08	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	493.6	999.9	1987.8	1.000x - 1.064	0.999
H-B09	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	503.7	1006.2	2014.3	0.994x + 14.192	1.000
H-B10	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	496.9	999.4	2012.4	0.998x + 1.930	1.000



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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

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	05/01/2026	50	100	200	49.3	99.4	200.8	0.991x + 0.486	1.000
L-B02	Dwyer	VFA-21	05/01/2026	50	100	200	50.9	98.2	199.9	1.006x - 0.455	0.999
L-B03	Dwyer	VFA-21	05/01/2026	50	100	200	50.1	100.9	198.8	1.000x - 0.187	1.000
L-B04	Dwyer	VFA-21	05/01/2026	50	100	200	50.0	98.3	202.7	1.000x - 0.719	0.999
L-B05	Dwyer	VFA-21	07/01/2026	50	100	200	49.4	98.8	199.3	1.004x - 1.970	0.999
L-B06	Dwyer	VFA-21	05/01/2026	50	100	200	50.5	100.1	201.3	1.002x - 0.393	0.999
L-B07	Dwyer	VFA-21	05/01/2026	50	100	200	50.5	100.3	200.2	1.003x + 0.203	1.000
L-B08	Dwyer	VFA-21	05/01/2026	50	100	200	50.8	99.8	200.5	0.990x + 1.110	1.000
L-B09	Dwyer	VFA-21	05/01/2026	50	100	200	49.0	99.1	204.4	0.992x + 1.858	0.999
L-B10	Dwyer	VFA-21	05/01/2026	50	100	200	50.4	99.6	198.2	1.012x - 1.609	1.000



GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0825/23032

Instrument Type : Gas Chromatography

Model : 3800

Serial Number : 00734

Organization : S.P.S. Consulting Service Co., Ltd.

Address : 7 Phahonyothin Soi 24 Phahonyothin Rd. Ladyao Chatuchak Bangkok 10900

Date : 02/08/2025

ELECTRONIC TEST

CPU	☒ PASS	☐ FAIL
DISPLAY & LED TEST	☒ PASS	☐ FAIL
VENT TEST	☒ PASS	☐ FAIL
KEY ECHO TEST	☒ PASS	☐ FAIL
DESTRUCTION RAM TEST	☒ PASS	☐ FAIL

RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detectors (FID Channel-Front)

INJECTOR : 1079 Injector

GC CONDITION:

Column	80 °C hold 1 min., rate 20 °C/min. to 200 °C hold 1min.
Injector	220 °C
Detector	300 °C
Column flow	5 mL/min
Makeup flow	25 mL/min
Air flow	300 mL/min
Hydrogen flow	30 mL/min

Column: Capillary Column CP sil 5 CB 0.25 ID x 15 M

Sample: 1 µL Injection FID Test Sample 0.218g/L C14,C15,C16 in hexane (diluted to 30ppm)

SENSITIVITY TEST: C15. (Area count) = 515,940 Counts.





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Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thuwatt@thaiunique.com, Website : www.thaiunique.com

Detector Sensitivity (FID)

Detector Response	Result	Specification
Baseline Noise (μV)	2.40	≤ 50
Baseline Drift (%)	0.18	≤ 1
Sensitivity (S/N for C15)	19,716	$\geq 1,024$

Temperature Specification

Temperature	Set	Result	Specification
Column Oven ($^{\circ}C$)	80	79	± 5
Injector ($^{\circ}C$)	220	218	± 5
Detector ($^{\circ}C$)	300	298	± 5
Incubator ($^{\circ}C$)	60	N/A	± 5

Relative Standard Deviation % (%RSD)

Checkout Procedure	Result	Specification
Area C15 (%)	1.48	≤ 5
Retention Time C15 (%)	0.08	≤ 0.5

APPROVAL

Engineer : Somchai Pohtongkam

Date : 02/08/2025



VARIAN



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Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 Area 1	506,043
C15 Area 2	520,497
C15 Area 3	522,154
C15 Area 4	521,664
C15 Area 5	509,340
C15 Area Average	515,940
* % RSD (< 5 %)	1.48

* The precision specification should be less than 2.0 % RSD ** (Relative Standard Deviation) for an Auto sampler injection and less than 5 % for Manual injections. To calculate the %RSD, select the C15 peak area for each of the five (5) samples.

** (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = (\text{std.dev} / \text{avg}) * 100$$

Compliance	☒ Pass	☐ Fail
Performance by		
Date	02/08/2025	



Comments			
Reviewed by			Date 02/08/2025



VARIAN



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THAI UNIQUE CO., LTD.

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Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawatt@thaiunique.com, Website : www.thaiunique.com

Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 RT 1	3.874
C15 RT 2	3.880
C15 RT 3	3.875
C15 RT 4	3.872
C15 RT 5	3.878
C15 RT Average	3.876
* % RSD (< 0.5 %)	0.08

* The precision specification should be less than 0.5 % RSD ** (Relative Standard Deviation) for an Auto sampler injection and less than 0.5 % for Manual injections. To calculate the %RSD, select the RT C15 peak for each of the five (5) samples.

** (Relative Standard Deviation is determined by dividing the standard deviation by the average and multiplying by 100.)

$$\% \text{ RSD} = (\text{std.dev} / \text{avg}) * 100$$

Compliance	☒ Pass	☐ Fail
Performance by		
Date	02/08/2025	



Comments			
Reviewed by			Date 02/08/2025



VARIAN

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

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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Office/Laboratory

668 Mu 2 Tambon Bangpoomai, Amphoe Muang Samutprakan,
Changwat Samutprakan 10280, Thailand
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(66) 08 3219 9440
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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 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 :



Approved by :



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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Noise B_083/26

Sound Level Meter Calibration Report

Acoustic Calibrator Data

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

Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B04	ACO	6236	00222298	04 March 2026	93.9	93.9
ACO-B05	ACO	6236	00222311	04 March 2026	93.8	93.9
ACO-B37	ACO	6236	00192028	04 March 2026	93.8	93.9
ACO-B44	ACO	6236	00222302	04 March 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	



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Noise B_319/26

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-B08	SCARLET	ST-12D	10351469	10 June 2026	93.8	93.9
ST-C1-B10	SCARLET	ST-12D	10351483	10 June 2026	93.9	93.9
ST-C1-B11	SCARLET	ST-12D	10351484	10 June 2026	93.8	93.9
ST-C1-B14	SCARLET	ST-12D	10351488	10 June 2026	93.7	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.89 ± 0.10 dB	