

ภาคผนวกที่ 4

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากแหล่งกำเนิด

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำทิ้ง

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำใต้ดิน

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพดิน

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงทั่วไป

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพอากาศในสถานประกอบการ

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับความร้อนในสถานประกอบการ

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงในสถานประกอบการ

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงสะสมแบบติดตัวบุคคล

เอกสารสอบเทียบเครื่องมือการตรวจการรับสัมผัสสารเคมี

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวิเคราะห์	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศในบรรยากาศ		
Total Suspended Particulate (TSP)	High Volume Air Sampler Rec No. R15, R17, R18 Blow No. R15, R17, R18	Digital Balance
Nitrogen Dioxide (NO ₂)	NO ₂ Analyzer No. R02, R03, R09	NO ₂ Analyzer No. R02, R03, R09
Sulfur Dioxide (SO ₂)	SO ₂ Analyzer No. R01, R02, R03	SO ₂ Analyzer No. R01, R02, R03
2. คุณภาพอากาศจากแหล่งกำเนิด		
Oxides of Nitrogen (NO _x)	Vacuum Gauge	Spectrophotometer
Carbon Monoxide (CO)	Personal Pump SKC No. R23 Rotameter No. H-R06	CO Analyzer No. B01
Sulfur Dioxide (SO ₂)	Personal Pump SKC No. R23 Rotameter No. H-R06	-
Chlorine (Cl)	Personal Pump SKC No. R13 Rotameter No. H-R06	IC
Hydrogen Chloride (HCl)	Personal Pump SKC No. R13 Rotameter No. H-R06	IC
Total Hydrocarbons (THC)	Personal Pump SKC No. R01 Rotameter No. H-R06	THC-Analyzer No. R01
3. คุณภาพน้ำทิ้ง		
pH	-	pH Meter
Temperature	-	Thermometer
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
4. คุณภาพน้ำใต้ดิน		
pH	-	pH Meter
Benzene	-	GC/MS
Toluene	-	GC/MS
Xylene	-	GC/MS
TPH (C ₅ -C ₈)	-	GC/MS
TPH (C ₈ -C ₁₆)	-	GC/MS
TPH (C ₁₆ -C ₃₅)	-	GC/MS

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)**

รายการตรวจวิเคราะห์	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
5. คุณภาพดิน		
Benzene	-	GC/MS
Toluene	-	GC/MS
Xylene	-	GC/MS
TPH (C ₅ -C ₈)	-	GC/MS
TPH (C ₈ -C ₁₆)	-	GC/MS
TPH (C ₁₆ -C ₃₅)	-	GC/MS
6. ระดับเสียงทั่วไป		
L _{eq} 24 hr., L _{max}	Acoustic Calibrator Sound Level Meter No. ACO-R06, R15, R19, R28	-
7. คุณภาพอากาศในสถานประกอบการ		
Chlorine	Personal Pump SKC No. R24, R25, R28, R42 Rotameter No. H-R02	Spectrophotometer
Propylene	Personal Pump SKC No. R22, R26, R32 Rotameter No. L-R02	GC/MS
Propane	Personal Pump SKC No. R22, R26, R32 Rotameter No. L-R02	GC/MS
Ethane	Personal Pump SKC No. R22, R26, R32 Rotameter No. L-R02	GC/MS
Total Hydrocarbons	Personal Pump SKC No. R13, R22, R32 Rotameter No. L-R02	THC Analyzer No. B01, R01
Non Methane Hydrocarbons	Personal Pump SKC No. R13, R22, R32 Rotameter No. L-R02	THC Analyzer No. B01, R01
8. ระดับความร้อนในสถานประกอบการ		
WBGT	Heat Stress WBGT Meter No. R05, R06, R08	-
9. ระดับเสียงในสถานประกอบการ		
L _{eq} 8 hr, L _{max} และ Octave Band	Acoustic Calibrator Sound Level Meter No. ACO R40, R41, R50, R51, R52	-
10. ระดับเสียงสะสมแบบติดตัวบุคคล		
Noise Dose	Acoustic Calibrator Sound Level Meter No. NMD B18, B19, B20, R02, R03, R06, R13, R22, R26, R35	-

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวิเคราะห์	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
11. การรับสัมผัสสารเคมี		
Benzene	Personal Pump SKC No. R23 Rotameter No. L-R02	GC/FID
Toluene	Personal Pump SKC No. R23 Rotameter No. L-R02	GC/FID
Xylene	Personal Pump SKC No. R23 Rotameter No. L-R02	GC/FID
Ethylbenzene	Personal Pump SKC No. R23 Rotameter No. L-R02	GC/FID

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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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
B35	B35	04/02/2026	$y = 1.154x - 3.696$	0.996
B36	B36	04/02/2026	$y = 1.119x - 2.463$	0.997
B37	B37	04/02/2026	$y = 1.129x - 3.721$	0.998
B38	B38	02/02/2026	$y = 1.182x - 2.931$	0.997
B39	B39	02/02/2026	$y = 1.062x - 1.512$	0.999
B40	B40	02/02/2026	$y = 1.163x - 3.556$	0.997
B41	B41	02/02/2026	$y = 1.116x - 1.975$	0.996
B42	B42	02/02/2026	$y = 1.152x - 4.140$	0.997
B43	B43	02/02/2026	$y = 1.167x - 3.646$	0.996
B44	B44	02/02/2026	$y = 1.178x - 4.362$	0.999
R01	R01	02/02/2026	$y = 1.097x - 2.630$	0.997
R02	R02	02/02/2026	$y = 1.138x - 3.218$	0.996
R03	R03	02/02/2026	$y = 1.133x - 3.084$	0.998
R04	R04	02/02/2026	$y = 1.121x - 2.102$	0.998
R05	R05	02/02/2026	$y = 1.041x + 0.894$	0.997
R06	R06	02/02/2026	$y = 1.075x + 0.254$	0.997
R07	R07	03/02/2026	$y = 1.126x - 2.841$	0.996
R08	R08	03/02/2026	$y = 1.091x - 2.104$	0.996
R09	R09	03/02/2026	$y = 1.065x + 0.557$	0.996
R10	R10	03/02/2026	$y = 1.093x - 1.217$	0.999
R11	R11	03/02/2026	$y = 1.130x - 3.938$	0.999
R12	R12	05/02/2026	$y = 1.164x - 2.698$	0.997
R13	R13	05/02/2026	$y = 1.120x - 3.336$	0.998
R14	R14	05/02/2026	$y = 1.034x + 0.445$	0.997
R15	R15	05/02/2026	$y = 1.076x + 0.429$	0.998
R16	R16	05/02/2026	$y = 1.107x - 1.468$	0.996
R17	R17	05/02/2026	$y = 1.078x - 1.668$	0.998
R18	R18	05/02/2026	$y = 1.160x - 5.001$	0.997
R19	R19	05/02/2026	$y = 1.077x - 2.680$	0.997
R20	R20	05/02/2026	$y = 1.185x - 4.839$	0.998

Calibrated by :


(Mr. Abdul Dangklom)

Approved by :


(Mr. Peera Detudom)



CERTIFICATE No : 26M2266
REFERENCE No : 80204-1

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : DIGITAL BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL : XS105DU
SERIAL No : 1126422905
ID No : BA 05/50
CONDITION AS RECEIVED : USED ITEM
SUBMITTED BY : S.P.S. CONSULTING SERVICE CO., LTD.
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN RD.,
JOMPOL, CHATUCHAK, BANGKOK 10900

CALIBRATED BY : SUCHAT S.

CALIBRATION DATE : 05-Mar-26

APPROVED BY :  PONGSAK J.

ISSUED DATE : 06-Mar-26

RECEIVED DATE : 05-Mar-26





CERTIFICATE No : 26M2266

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU
MANUFACTURER : METTLER TOLEDO S/N : 1126422905
ID No : BA 05/50 RECEIVED DATE : 05-Mar-26
AIR PRESSURE : 1004mbar $\pm$ 1mbar CALIBRATION DATE : 05-Mar-26
AMBIENT TEMPERATURE : 25° C $\pm$ 1° C RELATIVE HUMIDITY : 50 %RH $\pm$ 10 % RH

CONDITION OF THIS RESULTS OF CALIBRATION

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

2. REFERENCE STANDARD INSTRUMENTS :-

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

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

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

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

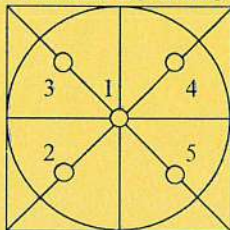
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



POINT	READING (g)
1	50.0000
2	50.0000
3	50.0000
4	50.0000
5	50.0000
OFF-CENTER LOADING	0.0000

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

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

END OF CALIBRATION REPORT





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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	01 March 2026	BRAND :	API	MODEL :	200E
NO.	NOX-R01	SERIAL NO.	769		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700
Last Cal. Date	: 24 October 2025			Serial No.	: 421
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.	24.5	°C
% RH	49				
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	-0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.004
NO _x Span	400	400.3	0.075	400.0	1.006
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	79	cc/min	80 ± 15		
PMT	103.6	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	770	V	420 - 900 constant		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.1	°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	1.004	-	1.0 ± 0.3		
NO _x Slope	1.006	-	1.0 ± 0.3		
NO Offset	0.8	mV	-20 to +150		
NO _x Offset	0.4	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

Heeson L.

(Mr.Heeson Lormae)

Approved by :

Yuthana J.

(Mr.Yuthana Tanatharanit)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	01 March 2026	BRAND :	API	MODEL :	200E
NO.	NOX-R02	SERIAL NO.	2285		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700		
Last Cal. Date : 24 October 2025			Serial No. : 421		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00674SV		
Certified Date : 12 March 2025		Expired Date : 12 March 2028		Cylinder Conc. : 48.7 ppm	
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.5	°C
			% RH	49	
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	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.005
NO _x Span	400	400.3	0.075	400.0	1.007
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	509	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.8	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCCELL PRESS	8.3	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	1.005	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	0.9	mV	-20 to +150		
NO _x Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yutthana S.

(Mr. Yutthana Tanathanit)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	01 March 2026	BRAND :	API	MODEL :	200E
NO.	NOX-R03	SERIAL NO.	4410		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700
Last Cal. Date	: 24 October 2025			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00674SV
Certified Date	: 12 March 2025	Expired Date	: 12 March 2028	Cylinder Conc.	: 48.7 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	49	
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	0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.002
NO _x Span	400	400.3	0.075	400.0	1.006
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	510	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	102.8	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP.	50.4	°C	50 ± 1		
BOX TEMP	29.0	°C	8 - 48		
PMT TEMP	7.5	°C	7 ± 2		
MOLY TEMP	315.3	°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	1.002	-	1.0 ± 0.3		
NO _x Slope	1.006	-	1.0 ± 0.3		
NO Offset	0.8	mV	-20 to +150		
NO _x Offset	0.3	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

Heeson L.

(Mr.Heeson Lormae)

Approved by :

Yutthana S.

(Mr.Yutthana Tanatharanit)



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

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	01 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R02	SERIAL NO.	3431		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700
Last Cal. Date	: 24 October 2025			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A00814SK
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	48				
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	-0.10	-	0	-
SO ₂ Span	400.0	400.1	0.025	400.0	1.005
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.3	mV	-20-150 with Zero Air		
UV LAMP	2892.3	mV	1000-4900		
STR. LGT	60.9	PPB	<100		
DRK PMT	62.7	mV	-50 - 200		
DRK LMP	57.6	mV	-50 - 200		
HVPS	672	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.2	°C	5-40		
PMT TEMP	7.2	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.005	-	1.0 ± 0.3		
SO ₂ Offset	21.8	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Heeson L.
(Mr.Heeson Lormae)

Approved by :

Yuthana S.
(Mr.Yuthana Tanatharanit)



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CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	01 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R03			SERIAL NO.	3488
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700
Last Cal. Date	: 24 October 2025			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A008145K
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.6	°C
			% RH	49	
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	-
SO ₂ Span	400.0	400.2	0.050	400.0	1.008
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.6	in-Hg	25-35		
SAMPLE FLOW	655	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	2882.3	mV	1000-4900		
STR. LGT	61.4	PPB	<100		
DRK PMT	63.1	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2518	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.1	°C	5-40		
PMT TEMP	7.0	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.008	-	1.0 ± 0.3		
SO ₂ Offset	22.1	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Heeson L.
(Mr.Heeson Lormae)

Approved by :

Yutthana S.
(Mr.Yutthana Tanatharanit)



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

CALIBRATION REPORT					
SO ₂ FLUORESCENT ANALYZER					
DATE :	01 March 2026	BRAND :	API	MODEL :	100E
NO.	SO ₂ -R09	SERIAL NO.	76		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700
Last Cal. Date	: 24 October 2025			Serial No.	: 421
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO ₂)			Cylinder No.	: A008145K
Certified Date	: 21 June 2021	Expired Date	: 21 June 2029	Cylinder Conc.	: 49.8 ppm
CALIBRATING CONDITION					
Pressure	1010	mmbar	Temp.	24.6	°C
% RH	49				
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	0.10	-	0	-
SO ₂ Span	400.0	400.3	0.075	400.0	1.005
API Model 100E SO ₂ Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.3	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.1	mV	-20-150 with Zero Air		
UV LAMP	3017.8	mV	1000-4900		
STR. LGT	61.2	PPB	<100		
DRK PMT	63.5	mV	-50 - 200		
DRK LMP	57.8	mV	-50 - 200		
HVPS	674	V	550-900 constant		
DCPS	2515	mV	2500 ± 200		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO ₂ Span Conc	400	PPB	20-20,000		
SO ₂ Slope	1.005	-	1.0 ± 0.3		
SO ₂ Offset	22.0	mV	<250		
Stability at Zero	0.1	PPB	<0.2		
Stability at Span	0.2	PPB	0.5% of reading (above 50 ppb)		

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

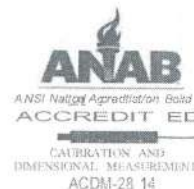
Yutthana S.
(Mr. Yutthana Tanatharanit)

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากแหล่งกำเนิด



CALIBRATION LABORATORY Co.,LTD.

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



CERTIFICATE OF CALIBRATION FOR

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

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

DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED: 24 July 2025

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

Calibrated By : Sittipong Pimdee
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
24 July 2025



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

Certificate No. Q24076549

F3-011-05/12-23

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

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CALIBRATION AND
DIMENSIONAL MEASUREMENT
ACDM-2814

REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS

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

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

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

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

TRACEABILITY :

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

UNCERTAINTY :

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

Certificate No. Q24076549

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

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

SITHIPORN
associates



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 :

Nitinun Srihawan

Approved by :

Wichok B.
(Wichok Ekpongpradit)

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

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 2 of 4

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01

The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution

The calibration procedure used was based on ASTM E275-01, ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

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

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

3. This certificate is traceable to the international system of unit maintained at :

3.1 The UK National Physical Laboratory (NPL)

Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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

Result of calibration : Photometric Accuracy

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

UUC* = Unit Under Calibration

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 4 of 4

Result of calibration : Photometric Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 190 nm - 1100 nm

Scanning Speed 7.5 nm/min

Band width(Wavelength) 1.0

Band width(Vis) 1.0

Band width(Uv) 1.0

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

**Specific Acceptance :

Transmission ≤ 1.0 T(%), Absorbance ≥ 2.0 A

**Stray light not TISI Accredited

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

End of Calibration Certificate



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพลโยธิน 24 ถนนพลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chafuchak, 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 : 136833

Environmental Conditions

Temperature 25 $\pm$ 3 $^{\circ}$ C
Pressure 1010 $\pm$ 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	05/01/2026	1,000	1,500	2,000	999	1,505	2,009	1.011x - 15.308	1.000
R02	SKC	224-PCXR4	626450	05/01/2026	1,000	2,000	3,000	1,001	1,505	2,005	1.005x - 5.625	1.000
R03	SKC	224-PCXR4	691592	05/01/2026	1,000	1,500	2,000	998	1,499	2,010	1.009x - 11.382	1.000
R04	SKC	224-PCXR4	691672	05/01/2026	1,000	1,500	2,000	999	1,496	2,000	0.992x + 5.045	0.999
R05	SKC	224-PCXR4	798470	06/01/2026	1,000	1,500	2,000	997	1,480	1,991	0.995x - 8.487	0.999
R06	SKC	224-PCXR4	798456	06/01/2026	1,000	1,500	2,000	1,000	1,502	1,992	0.993x + 2.874	0.999
R07	SKC	224-PCXR4	798480	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,000	1.000x + 1.559	1.000
R08	SKC	224-PCXR4	883215	07/01/2026	1,000	1,500	2,000	1,001	1,500	2,000	1.004x - 8.216	1.000
R09	SKC	224-PCXR4	034650	05/01/2026	1,000	1,500	2,000	999	1,509	2,005	1.005x - 6.025	1.000
R10	SKC	224-PCXR4	091765	05/01/2026	1,000	1,500	2,000	1,001	1,509	2,008	1.007x - 8.311	1.000
R11	SKC	224-PCXR4	091763	05/01/2026	1,000	1,500	2,000	999	1,502	1,995	1.002x - 10.594	0.999
R12	SKC	224-PCXR4	091568	06/01/2026	1,000	1,500	2,000	999	1,495	1,994	0.994x - 1.683	0.999
R13	SKC	224-PCXR4	091638	06/01/2026	1,000	1,500	2,000	999	1,499	1,994	0.998x - 7.136	0.999
R14	SKC	224-PCXR4	091764	06/01/2026	1,000	1,500	2,000	1,004	1,507	2,006	1.007x - 8.975	1.000
R15	SKC	224-PCXR8	529457	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,002	0.999x + 1.731	1.000
R16	SKC	224-PCXR8	529643	05/01/2026	1,000	1,500	2,000	1,001	1,511	2,010	1.010x - 13.433	1.000
R17	SKC	224-PCXR8	529645	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,003	0.998x + 4.238	1.000
R18	SKC	224-PCXR8	566756	05/01/2026	1,000	1,500	2,000	1,003	1,504	2,006	1.004x - 3.774	1.000
R19	SKC	224-PCXR8	566802	05/01/2026	1,000	1,500	2,000	1,003	1,498	1,995	1.001x - 8.224	0.999
R20	SKC	224-PCXR8	529089	06/01/2026	1,000	1,500	2,000	997	1,509	1,985	0.994x + 5.269	0.999
R21	SKC	224-PCXR8	665728	06/01/2026	1,000	1,500	2,000	1,000	1,510	1,995	0.998x - 1.139	0.999
R22	SKC	224-PCXR8	707444	05/01/2026	1,000	1,500	2,000	1,004	1,507	2,008	1.004x - 5.709	1.000
R23	SKC	224-PCXR8	761067	05/01/2026	1,000	1,500	2,000	1,009	1,504	2,006	1.000x + 1.179	1.000
R24	SKC	224-PCXR8	707893	05/01/2026	1,000	1,500	2,000	999	1,497	1,992	0.998x - 8.383	0.999
R25	SKC	224-PCXR8	761052	06/01/2026	1,000	1,500	2,000	998	1,503	1,975	0.984x + 17.071	0.999
R26	SKC	224-PCXR8	707956	05/01/2026	1,000	1,500	2,000	997	1,492	1,992	0.991x + 0.388	1.000
R27	SKC	224-PCXR8	707398	05/01/2026	1,000	1,500	2,000	1,000	1,495	2,002	1.002x - 3.898	1.000
R28	SKC	224-PCXR8	707481	06/01/2026	1,000	1,500	2,000	1,009	1,503	2,008	0.996x + 8.659	1.000
R29	SKC	224-PCXR8	707402	07/01/2026	1,000	1,500	2,000	1,006	1,513	2,009	1.002x - 1.219	0.999
R30	SKC	224-PCXR8	093811	07/01/2026	1,000	1,500	2,000	1,001	1,513	2,008	1.008x - 9.239	1.000
R31	SKC	224-PCXR8	093183	06/01/2026	1,000	1,500	2,000	1,010	1,507	2,013	1.003x - 0.780	1.000
R32	SKC	224-PCXR8	671950	06/01/2026	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000
R33	SKC	224-PCXR4	626254	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.149	1.000
R34	SKC	224-PCXR4	626131	05/01/2026	1,000	1,500	2,000	996	1,498	2,003	1.010x - 18.178	1.000
R35	SKC	224-PCXR8	707460	05/01/2026	1,000	1,500	2,000	1,006	1,496	2,004	0.999x + 0.388	1.000
R36	SKC	224-PCXR8	707446	05/01/2026	1,000	1,500	2,000	1,006	1,504	2,008	1.005x - 6.281	1.000
R37	SKC	224-PCXR8	707432	06/01/2026	1,000	1,500	2,000	1,003	1,505	2,004	1.004x - 5.005	1.000
R38	SKC	224-PCXR8	707349	06/01/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x - 1.655	1.000
R39	SKC	224-PCXR8	761095	06/01/2026	1,000	1,500	2,000	1,000	1,497	2,003	1.005x - 8.068	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detodom
(Mr. Peera Detodom)



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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

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-R01	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	503.6	992.4	1980.9	0.999x - 3.140	0.999
H-R02	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	500.8	995.8	1986.2	1.002x - 5.343	1.000
H-R03	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	495.3	992.1	1982.9	1.004x - 17.510	0.999
H-R04	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	496.4	994.6	2019.5	1.007x - 11.385	1.000
H-R05	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	497.2	991.5	1987.3	1.003x - 7.563	1.000
H-R06	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	501.1	992.4	1982.9	1.001x - 6.139	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	02 March 2026	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure : 1011 mmbar		Temp. : 24.6 °C		% RH : 50	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response		%Dif	
Zero	0	0.10		-	
CO Span	40.00	39.96		-0.100	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4013.8	mV	2500-4800 mV		
CO Reference	3947.5	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.7	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	806	CC/Min	800 ± 10%		
Sample Temperature	48.4	°C	48 ± 4		
Bench Temperature	48.1	°C	48 ± 2		
Wheel Temperature	68.2	°C	68 ± 2		
Box Temperature	30.9	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3036.4	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

Adul Dangklom

(Mr.Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature 25 $\pm$ 3 $^{\circ}$ C
Pressure 1010 $\pm$ 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	05/01/2026	1,000	1,500	2,000	999	1,505	2,009	1.011x - 15.308	1.000
R02	SKC	224-PCXR4	626450	05/01/2026	1,000	2,000	3,000	1,001	1,505	2,005	1.005x - 5.625	1.000
R03	SKC	224-PCXR4	691592	05/01/2026	1,000	1,500	2,000	998	1,499	2,010	1.009x - 11.382	1.000
R04	SKC	224-PCXR4	691672	05/01/2026	1,000	1,500	2,000	999	1,496	2,000	0.992x + 5.045	0.999
R05	SKC	224-PCXR4	798470	06/01/2026	1,000	1,500	2,000	997	1,480	1,991	0.995x - 8.487	0.999
R06	SKC	224-PCXR4	798456	06/01/2026	1,000	1,500	2,000	1,000	1,502	1,992	0.993x + 2.874	0.999
R07	SKC	224-PCXR4	798480	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,000	1.000x + 1.559	1.000
R08	SKC	224-PCXR4	883215	07/01/2026	1,000	1,500	2,000	1,001	1,500	2,000	1.004x - 8.216	1.000
R09	SKC	224-PCXR4	034650	05/01/2026	1,000	1,500	2,000	999	1,509	2,005	1.005x - 6.025	1.000
R10	SKC	224-PCXR4	091765	05/01/2026	1,000	1,500	2,000	1,001	1,509	2,008	1.007x - 8.311	1.000
R11	SKC	224-PCXR4	091763	05/01/2026	1,000	1,500	2,000	999	1,502	1,995	1.002x - 10.594	0.999
R12	SKC	224-PCXR4	091568	06/01/2026	1,000	1,500	2,000	999	1,495	1,994	0.994x - 1.683	0.999
R13	SKC	224-PCXR4	091638	06/01/2026	1,000	1,500	2,000	999	1,499	1,994	0.998x - 7.136	0.999
R14	SKC	224-PCXR4	091764	06/01/2026	1,000	1,500	2,000	1,004	1,507	2,006	1.007x - 8.975	1.000
R15	SKC	224-PCXR8	529457	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,002	0.999x + 1.731	1.000
R16	SKC	224-PCXR8	529643	05/01/2026	1,000	1,500	2,000	1,001	1,511	2,010	1.010x - 13.433	1.000
R17	SKC	224-PCXR8	529645	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,003	0.998x + 4.238	1.000
R18	SKC	224-PCXR8	566756	05/01/2026	1,000	1,500	2,000	1,003	1,504	2,006	1.004x - 3.774	1.000
R19	SKC	224-PCXR8	566802	05/01/2026	1,000	1,500	2,000	1,003	1,498	1,995	1.001x - 8.224	0.999
R20	SKC	224-PCXR8	529089	06/01/2026	1,000	1,500	2,000	997	1,509	1,985	0.994x + 5.269	0.999
R21	SKC	224-PCXR8	665728	06/01/2026	1,000	1,500	2,000	1,000	1,510	1,995	0.998x - 1.139	0.999
R22	SKC	224-PCXR8	707444	05/01/2026	1,000	1,500	2,000	1,004	1,507	2,008	1.004x - 5.709	1.000
R23	SKC	224-PCXR8	761067	05/01/2026	1,000	1,500	2,000	1,009	1,504	2,006	1.000x + 1.179	1.000
R24	SKC	224-PCXR8	707893	05/01/2026	1,000	1,500	2,000	999	1,497	1,992	0.998x - 8.383	0.999
R25	SKC	224-PCXR8	761052	06/01/2026	1,000	1,500	2,000	998	1,503	1,975	0.984x + 17.071	0.999
R26	SKC	224-PCXR8	707956	05/01/2026	1,000	1,500	2,000	997	1,492	1,992	0.991x + 0.388	1.000
R27	SKC	224-PCXR8	707398	05/01/2026	1,000	1,500	2,000	1,000	1,495	2,002	1.002x - 3.898	1.000
R28	SKC	224-PCXR8	707481	06/01/2026	1,000	1,500	2,000	1,009	1,503	2,008	0.996x + 8.659	1.000
R29	SKC	224-PCXR8	707402	07/01/2026	1,000	1,500	2,000	1,006	1,513	2,009	1.002x - 1.219	0.999
R30	SKC	224-PCXR8	093811	07/01/2026	1,000	1,500	2,000	1,001	1,513	2,008	1.008x - 9.239	1.000
R31	SKC	224-PCXR8	093183	06/01/2026	1,000	1,500	2,000	1,010	1,507	2,013	1.003x - 0.780	1.000
R32	SKC	224-PCXR8	671950	06/01/2026	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000
R33	SKC	224-PCXR4	626254	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.149	1.000
R34	SKC	224-PCXR4	626131	05/01/2026	1,000	1,500	2,000	996	1,498	2,003	1.010x - 18.178	1.000
R35	SKC	224-PCXR8	707460	05/01/2026	1,000	1,500	2,000	1,006	1,496	2,004	0.999x + 0.388	1.000
R36	SKC	224-PCXR8	707446	05/01/2026	1,000	1,500	2,000	1,006	1,504	2,008	1.005x - 6.281	1.000
R37	SKC	224-PCXR8	707432	06/01/2026	1,000	1,500	2,000	1,003	1,505	2,004	1.004x - 5.005	1.000
R38	SKC	224-PCXR8	707349	06/01/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x - 1.655	1.000
R39	SKC	224-PCXR8	761095	06/01/2026	1,000	1,500	2,000	1,000	1,497	2,003	1.005x - 8.068	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detodom
(Mr. Peera Detodom)



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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 : 136833

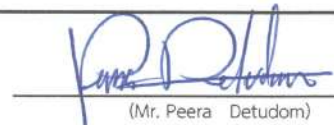
Calibration Data

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-R01	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	503.6	992.4	1980.9	0.999x - 3.140	0.999
H-R02	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	500.8	995.8	1986.2	1.002x - 5.343	1.000
H-R03	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	495.3	992.1	1982.9	1.004x - 17.510	0.999
H-R04	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	496.4	994.6	2019.5	1.007x - 11.385	1.000
H-R05	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	497.2	991.5	1987.3	1.003x - 7.563	1.000
H-R06	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	501.1	992.4	1982.9	1.001x - 6.139	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



Certificate of Calibration

Aquion : Anion (ID#894)

This certificate is to verify that instrument below are calibrated

by Archemica Lab Co.,Ltd.

AQUION S/N : 190840059

AS-DV S/N : 190915235

for

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



Operator Signature : Wasin Date : April 27, 2026

(Mr. Wasin Nintalad)

Test Engineer



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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 : 136833

Environmental Conditions

Temperature 25 $\pm$ 3 $^{\circ}$ C
Pressure 1010 $\pm$ 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	05/01/2026	1,000	1,500	2,000	999	1,505	2,009	1.011x - 15.308	1.000
R02	SKC	224-PCXR4	626450	05/01/2026	1,000	2,000	3,000	1,001	1,505	2,005	1.005x - 5.625	1.000
R03	SKC	224-PCXR4	691592	05/01/2026	1,000	1,500	2,000	998	1,499	2,010	1.009x - 11.382	1.000
R04	SKC	224-PCXR4	691672	05/01/2026	1,000	1,500	2,000	999	1,496	2,000	0.992x + 5.045	0.999
R05	SKC	224-PCXR4	798470	06/01/2026	1,000	1,500	2,000	997	1,480	1,991	0.995x - 8.487	0.999
R06	SKC	224-PCXR4	798456	06/01/2026	1,000	1,500	2,000	1,000	1,502	1,992	0.993x + 2.874	0.999
R07	SKC	224-PCXR4	798480	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,000	1.000x + 1.559	1.000
R08	SKC	224-PCXR4	883215	07/01/2026	1,000	1,500	2,000	1,001	1,500	2,000	1.004x - 8.216	1.000
R09	SKC	224-PCXR4	034650	05/01/2026	1,000	1,500	2,000	999	1,509	2,005	1.005x - 6.025	1.000
R10	SKC	224-PCXR4	091765	05/01/2026	1,000	1,500	2,000	1,001	1,509	2,008	1.007x - 8.311	1.000
R11	SKC	224-PCXR4	091763	05/01/2026	1,000	1,500	2,000	999	1,502	1,995	1.002x - 10.594	0.999
R12	SKC	224-PCXR4	091568	06/01/2026	1,000	1,500	2,000	999	1,495	1,994	0.994x - 1.683	0.999
R13	SKC	224-PCXR4	091638	06/01/2026	1,000	1,500	2,000	999	1,499	1,994	0.998x - 7.136	0.999
R14	SKC	224-PCXR4	091764	06/01/2026	1,000	1,500	2,000	1,004	1,507	2,006	1.007x - 8.975	1.000
R15	SKC	224-PCXR8	529457	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,002	0.999x + 1.731	1.000
R16	SKC	224-PCXR8	529643	05/01/2026	1,000	1,500	2,000	1,001	1,511	2,010	1.010x - 13.433	1.000
R17	SKC	224-PCXR8	529645	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,003	0.998x + 4.238	1.000
R18	SKC	224-PCXR8	566756	05/01/2026	1,000	1,500	2,000	1,003	1,504	2,006	1.004x - 3.774	1.000
R19	SKC	224-PCXR8	566802	05/01/2026	1,000	1,500	2,000	1,003	1,498	1,995	1.001x - 8.224	0.999
R20	SKC	224-PCXR8	529089	06/01/2026	1,000	1,500	2,000	997	1,509	1,985	0.994x + 5.269	0.999
R21	SKC	224-PCXR8	665728	06/01/2026	1,000	1,500	2,000	1,000	1,510	1,995	0.998x - 1.139	0.999
R22	SKC	224-PCXR8	707444	05/01/2026	1,000	1,500	2,000	1,004	1,507	2,008	1.004x - 5.709	1.000
R23	SKC	224-PCXR8	761067	05/01/2026	1,000	1,500	2,000	1,009	1,504	2,006	1.000x + 1.179	1.000
R24	SKC	224-PCXR8	707893	05/01/2026	1,000	1,500	2,000	999	1,497	1,992	0.998x - 8.383	0.999
R25	SKC	224-PCXR8	761052	06/01/2026	1,000	1,500	2,000	998	1,503	1,975	0.984x + 17.071	0.999
R26	SKC	224-PCXR8	707956	05/01/2026	1,000	1,500	2,000	997	1,492	1,992	0.991x + 0.388	1.000
R27	SKC	224-PCXR8	707398	05/01/2026	1,000	1,500	2,000	1,000	1,495	2,002	1.002x - 3.898	1.000
R28	SKC	224-PCXR8	707481	06/01/2026	1,000	1,500	2,000	1,009	1,503	2,008	0.996x + 8.659	1.000
R29	SKC	224-PCXR8	707402	07/01/2026	1,000	1,500	2,000	1,006	1,513	2,009	1.002x - 1.219	0.999
R30	SKC	224-PCXR8	093811	07/01/2026	1,000	1,500	2,000	1,001	1,513	2,008	1.008x - 9.239	1.000
R31	SKC	224-PCXR8	093183	06/01/2026	1,000	1,500	2,000	1,010	1,507	2,013	1.003x - 0.780	1.000
R32	SKC	224-PCXR8	671950	06/01/2026	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000
R33	SKC	224-PCXR4	626254	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.149	1.000
R34	SKC	224-PCXR4	626131	05/01/2026	1,000	1,500	2,000	996	1,498	2,003	1.010x - 18.178	1.000
R35	SKC	224-PCXR8	707460	05/01/2026	1,000	1,500	2,000	1,006	1,496	2,004	0.999x + 0.388	1.000
R36	SKC	224-PCXR8	707446	05/01/2026	1,000	1,500	2,000	1,006	1,504	2,008	1.005x - 6.281	1.000
R37	SKC	224-PCXR8	707432	06/01/2026	1,000	1,500	2,000	1,003	1,505	2,004	1.004x - 5.005	1.000
R38	SKC	224-PCXR8	707349	06/01/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x - 1.655	1.000
R39	SKC	224-PCXR8	761095	06/01/2026	1,000	1,500	2,000	1,000	1,497	2,003	1.005x - 8.068	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detodom
(Mr. Peera Detodom)



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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

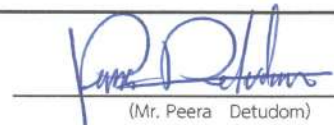
Calibration Data

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-R01	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	503.6	992.4	1980.9	0.999x - 3.140	0.999
H-R02	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	500.8	995.8	1986.2	1.002x - 5.343	1.000
H-R03	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	495.3	992.1	1982.9	1.004x - 17.510	0.999
H-R04	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	496.4	994.6	2019.5	1.007x - 11.385	1.000
H-R05	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	497.2	991.5	1987.3	1.003x - 7.563	1.000
H-R06	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	501.1	992.4	1982.9	1.001x - 6.139	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :


(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
S.P.S. CONSULTING SERVICE CO., LTD.
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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			
Total Hydrocarbon Analyzer			
Date :	02 March 2026	Brand :	HORIBA
No.	R01	Model :	APHA-370
		Serial No.	WDDN38N
Calibrator (Dilution System)			
Brand :	Teledyne	Model :	700
Last Cal. Date :	24 October 2025	Serial No.	421
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No.	D612165
Certified Date :	25 February 2023	Expired Date :	25 February 2031
		Cylinder Conc.	453 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
		% RH	50
		Start Time :	2:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.03	10
Calibration Setting (Final)			
Span Instrument Gain:	0.997	Finish Time:	3:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	912.2	mV	800-1,350
Signal (THC)	917.4	mV	800-1,350
Detector	78.0	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.1	kPa	8 - 25
NMC	259.5	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำทิ้ง



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

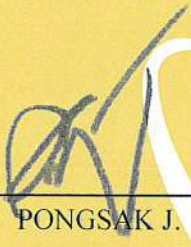
PAGE : 1 OF 3

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 : 
PONGSAK J.

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/</u> <u>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.

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

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 :



(Permpon Chanpu)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



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 : 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 : 
PONGSAK J.

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 :-

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

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

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

5. THIS CERTIFICATE IS TRACEABLE TO THE INTERNATIONAL SYSTEM OF UNIT MAINTAINED AT:-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

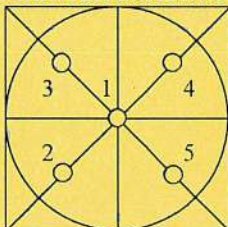
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

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

5. OFF CENTER LOADING ERROR



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

NOTE: THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA

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

END OF CALIBRATION REPORT



CERT.No.: HS-X014C

Certificate of Calibration

Calibration Date : 16 March 2026

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

7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,

Chatuchak, Bangkok, Thailand 10900

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 760.00 mmHg

Salinity : 0 ppt

Model : YSI 5000

S/N : 15B100751

Probe : YSI 5010

S/N : 22D100097

ID NO. :

Air Temp ref : S/N. F8065C26

Barometric ref : S/N. F8065C26

Water Temp ref : -

ID NO. HS001

Technician : Kittipong M.

Calibration Details

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

Mean Measurement	9.09	mg/l	-	-
Inaccuracy	0.00	mg/l	-	-

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



Technician Signature

(Kittipong Maekwong)



Laboratory Manager

(Natenapha Pisatkunchon)



QUALITY CALIBRATION CO., LTD.

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

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

www.qcalibration.com

CERTIFICATE No : 26T0464

REFERENCE No : 79659-1

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 : 
PONGSAK J.

ISSUED DATE : 30-Jan-26

RECEIVED DATE : 30-Jan-26

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





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

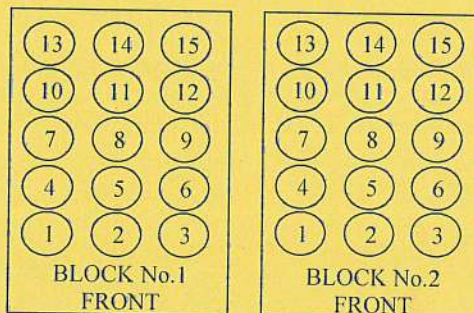
CONDITION OF THIS RESULTS OF CALIBRATION

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 MULTIPLIED BY A COVERAGE FACTOR k =2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%.

END OF CALIBRATION REPORT



เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำใต้ดิน



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

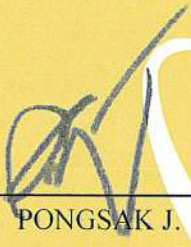
PAGE : 1 OF 3

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 : 
PONGSAK J.

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/</u> <u>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.

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

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



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)

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพดิน

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</i>	<i>Pass</i>
<i>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)

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงทั่วไป



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

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

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

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

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

Date of Receipt : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

1/2

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

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

Head Office

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Changwat Pathumthani 12120, Thailand
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Fax. (66) 0 2577 9009

Office/Laboratory

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Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
E-mail : mtc@tistr.or.th Website : www.tistr.or.th

Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

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

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

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 2011269012900497001

End of Certificate

2 / 2

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

FM.BL.MTC.002 Rev.5

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

Noise R_111/26

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-R06	ACO	6236	00152005	01 March 2026	93.9	93.9
ACO-R15	ACO	6236	00172062	01 March 2026	93.9	93.9
ACO-R19	ACO	6236	00182001	01 March 2026	93.9	93.9
ACO-R28	ACO	6236	00192040	01 March 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana J.
(Mr. Yutthana Tanatharanit)

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์
คุณภาพอากาศในสถานประกอบการ



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature 25 $\pm$ 3 $^{\circ}$ C
Pressure 1010 $\pm$ 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	05/01/2026	1,000	1,500	2,000	999	1,505	2,009	1.011x - 15.308	1.000
R02	SKC	224-PCXR4	626450	05/01/2026	1,000	2,000	3,000	1,001	1,505	2,005	1.005x - 5.625	1.000
R03	SKC	224-PCXR4	691592	05/01/2026	1,000	1,500	2,000	998	1,499	2,010	1.009x - 11.382	1.000
R04	SKC	224-PCXR4	691672	05/01/2026	1,000	1,500	2,000	999	1,496	2,000	0.992x + 5.045	0.999
R05	SKC	224-PCXR4	798470	06/01/2026	1,000	1,500	2,000	997	1,480	1,991	0.995x - 8.487	0.999
R06	SKC	224-PCXR4	798456	06/01/2026	1,000	1,500	2,000	1,000	1,502	1,992	0.993x + 2.874	0.999
R07	SKC	224-PCXR4	798480	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,000	1.000x + 1.559	1.000
R08	SKC	224-PCXR4	883215	07/01/2026	1,000	1,500	2,000	1,001	1,500	2,000	1.004x - 8.216	1.000
R09	SKC	224-PCXR4	034650	05/01/2026	1,000	1,500	2,000	999	1,509	2,005	1.005x - 6.025	1.000
R10	SKC	224-PCXR4	091765	05/01/2026	1,000	1,500	2,000	1,001	1,509	2,008	1.007x - 8.311	1.000
R11	SKC	224-PCXR4	091763	05/01/2026	1,000	1,500	2,000	999	1,502	1,995	1.002x - 10.594	0.999
R12	SKC	224-PCXR4	091568	06/01/2026	1,000	1,500	2,000	999	1,495	1,994	0.994x - 1.683	0.999
R13	SKC	224-PCXR4	091638	06/01/2026	1,000	1,500	2,000	999	1,499	1,994	0.998x - 7.136	0.999
R14	SKC	224-PCXR4	091764	06/01/2026	1,000	1,500	2,000	1,004	1,507	2,006	1.007x - 8.975	1.000
R15	SKC	224-PCXR8	529457	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,002	0.999x + 1.731	1.000
R16	SKC	224-PCXR8	529643	05/01/2026	1,000	1,500	2,000	1,001	1,511	2,010	1.010x - 13.433	1.000
R17	SKC	224-PCXR8	529645	06/01/2026	1,000	1,500	2,000	1,004	1,502	2,003	0.998x + 4.238	1.000
R18	SKC	224-PCXR8	566756	05/01/2026	1,000	1,500	2,000	1,003	1,504	2,006	1.004x - 3.774	1.000
R19	SKC	224-PCXR8	566802	05/01/2026	1,000	1,500	2,000	1,003	1,498	1,995	1.001x - 8.224	0.999
R20	SKC	224-PCXR8	529089	06/01/2026	1,000	1,500	2,000	997	1,509	1,985	0.994x + 5.269	0.999
R21	SKC	224-PCXR8	665728	06/01/2026	1,000	1,500	2,000	1,000	1,510	1,995	0.998x - 1.139	0.999
R22	SKC	224-PCXR8	707444	05/01/2026	1,000	1,500	2,000	1,004	1,507	2,008	1.004x - 5.709	1.000
R23	SKC	224-PCXR8	761067	05/01/2026	1,000	1,500	2,000	1,009	1,504	2,006	1.000x + 1.179	1.000
R24	SKC	224-PCXR8	707893	05/01/2026	1,000	1,500	2,000	999	1,497	1,992	0.998x - 8.383	0.999
R25	SKC	224-PCXR8	761052	06/01/2026	1,000	1,500	2,000	998	1,503	1,975	0.984x + 17.071	0.999
R26	SKC	224-PCXR8	707956	05/01/2026	1,000	1,500	2,000	997	1,492	1,992	0.991x + 0.388	1.000
R27	SKC	224-PCXR8	707398	05/01/2026	1,000	1,500	2,000	1,000	1,495	2,002	1.002x - 3.898	1.000
R28	SKC	224-PCXR8	707481	06/01/2026	1,000	1,500	2,000	1,009	1,503	2,008	0.996x + 8.659	1.000
R29	SKC	224-PCXR8	707402	07/01/2026	1,000	1,500	2,000	1,006	1,513	2,009	1.002x - 1.219	0.999
R30	SKC	224-PCXR8	093811	07/01/2026	1,000	1,500	2,000	1,001	1,513	2,008	1.008x - 9.239	1.000
R31	SKC	224-PCXR8	093183	06/01/2026	1,000	1,500	2,000	1,010	1,507	2,013	1.003x - 0.780	1.000
R32	SKC	224-PCXR8	671950	06/01/2026	1,000	1,500	2,000	999	1,498	1,999	1.000x + 0.668	1.000
R33	SKC	224-PCXR4	626254	06/01/2026	1,000	1,500	2,000	1,000	1,508	2,007	1.004x - 5.149	1.000
R34	SKC	224-PCXR4	626131	05/01/2026	1,000	1,500	2,000	996	1,498	2,003	1.010x - 18.178	1.000
R35	SKC	224-PCXR8	707460	05/01/2026	1,000	1,500	2,000	1,006	1,496	2,004	0.999x + 0.388	1.000
R36	SKC	224-PCXR8	707446	05/01/2026	1,000	1,500	2,000	1,006	1,504	2,008	1.005x - 6.281	1.000
R37	SKC	224-PCXR8	707432	06/01/2026	1,000	1,500	2,000	1,003	1,505	2,004	1.004x - 5.005	1.000
R38	SKC	224-PCXR8	707349	06/01/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x - 1.655	1.000
R39	SKC	224-PCXR8	761095	06/01/2026	1,000	1,500	2,000	1,000	1,497	2,003	1.005x - 8.068	1.000

Calibrated by :

Adul Dangklorn
(Mr. Adul Dangklorn)

Approved by :

Peera Detodom
(Mr. Peera Detodom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature : 25 $\pm$ 3 $^{\circ}$ C
Pressure : 1010 $\pm$ 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	05/01/2026	1,000	1,500	2,000	997	1,506	1,998	1.000x - 0.556	1.000
R41	SKC	224-PCXR4	626140	05/01/2026	1,000	1,500	2,000	995	1,504	1,992	0.996x - 3.574	0.999
R42	SKC	224-PCXR4	626463	05/01/2026	1,000	1,500	2,000	1,006	1,505	1,984	0.988x + 15.108	0.999
R43	SKC	224-PCXR4	626129	05/01/2026	1,000	1,500	2,000	993	1,504	1,972	0.982x + 17.902	0.999
R44	SKC	224-PCXR4	602753	06/01/2026	1,000	1,500	2,000	1,001	1,495	2,000	1.001x - 3.434	1.000
R45	SKC	224-PCXR4	626137	06/01/2026	1,000	1,500	2,000	998	1,494	1,997	0.996x + 1.827	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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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 : 136833

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-R01	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	503.6	992.4	1980.9	0.999x - 3.140	0.999
H-R02	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	500.8	995.8	1986.2	1.002x - 5.343	1.000
H-R03	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	495.3	992.1	1982.9	1.004x - 17.510	0.999
H-R04	Dwyer	VFB-65	05/01/2026	500	1,000	2,000	496.4	994.6	2019.5	1.007x - 11.385	1.000
H-R05	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	497.2	991.5	1987.3	1.003x - 7.563	1.000
H-R06	Dwyer	VFB-65	06/01/2026	500	1,000	2,000	501.1	992.4	1982.9	1.001x - 6.139	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

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-R01	Dwyer	VFA-21	05/01/2026	50	100	200	50.2	102.0	203.9	0.991x + 2.329	1.000
L-R02	Dwyer	VFA-21	05/01/2026	50	100	200	50.4	101.3	200.5	1.006x - 0.627	0.999
L-R03	Dwyer	VFA-21	06/01/2026	50	100	200	50.1	99.4	202.7	1.017x - 1.144	1.000
L-R04	Dwyer	VFA-21	06/01/2026	50	100	200	49.8	100.5	201.0	1.010x - 1.541	0.999
L-R05	Dwyer	VFA-21	05/01/2026	50	100	200	50.2	101.4	203.8	0.990x + 2.384	1.000
L-R06	Dwyer	VFA-21	06/01/2026	50	100	200	50.4	99.1	201.5	1.003x - 0.197	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature : 25 $\pm$ 3 $^{\circ}$ C
Pressure : 1010 $\pm$ 15 mmbar

Personal Pump Data					Calibration Data							
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)			y	R ²
					1	2	3	1	2	3		
R01	SKC	224-PCXR4	602467	01/04/2026	1,000	1,500	2,000	1,001	1,500	2,007	1.005x - 6.003	1.000
R02	SKC	224-PCXR4	626450	05/04/2026	1,000	2,000	3,000	1,000	1,503	2,001	1.001x - 0.383	1.000
R03	SKC	224-PCXR4	691592	03/04/2026	1,000	1,500	2,000	1,005	1,501	2,000	1.007x - 15.384	0.999
R04	SKC	224-PCXR4	691672	03/04/2026	1,000	1,500	2,000	1,007	1,513	1,999	0.996x + 5.855	0.999
R05	SKC	224-PCXR4	798470	05/04/2026	1,000	1,500	2,000	1,000	1,499	1,997	0.997x + 3.107	1.000
R06	SKC	224-PCXR4	798456	03/04/2026	1,000	1,500	2,000	998	1,497	1,996	0.998x + 0.120	1.000
R07	SKC	224-PCXR4	798480	05/04/2026	1,000	1,500	2,000	1,002	1,506	2,001	0.999x + 3.219	1.000
R08	SKC	224-PCXR4	883215	03/04/2026	1,000	1,500	2,000	1,004	1,501	1,992	1.003x - 9.877	0.999
R09	SKC	224-PCXR4	034650	03/04/2026	1,000	1,500	2,000	998	1,506	2,003	1.004x - 5.723	1.000
R10	SKC	224-PCXR4	091765	03/04/2026	1,000	1,500	2,000	999	1,507	1,996	1.005x - 13.080	0.999
R11	SKC	224-PCXR4	091763	05/04/2026	1,000	1,500	2,000	1,001	1,504	2,001	1.000x + 0.104	1.000
R12	SKC	224-PCXR4	091568	03/04/2026	1,000	1,500	2,000	998	1,505	1,996	0.998x + 1.482	1.000
R13	SKC	224-PCXR4	091638	03/04/2026	1,000	1,500	2,000	1,001	1,504	2,000	0.999x + 2.097	1.000
R14	SKC	224-PCXR4	091764	05/04/2026	1,000	1,500	2,000	1,007	1,506	2,001	1.004x - 8.866	0.999
R15	SKC	224-PCXR8	529457	05/04/2026	1,000	1,500	2,000	998	1,492	1,999	1.001x - 6.322	1.000
R16	SKC	224-PCXR8	529643	03/04/2026	1,000	1,500	2,000	1,004	1,506	2,004	1.007x - 11.726	0.999
R17	SKC	224-PCXR8	529645	05/04/2026	1,000	1,500	2,000	998	1,503	1,998	1.000x - 0.703	1.000
R18	SKC	224-PCXR8	566756	03/04/2026	1,000	1,500	2,000	999	1,508	1,995	1.002x - 8.012	0.999
R19	SKC	224-PCXR8	566802	05/04/2026	1,000	1,500	2,000	998	1,502	1,998	1.000x - 0.823	1.000
R20	SKC	224-PCXR8	529089	03/04/2026	1,000	1,500	2,000	999	1,503	1,996	0.997x + 2.001	1.000
R21	SKC	224-PCXR8	665728	03/04/2026	1,000	1,500	2,000	998	1,505	1,999	1.000x - 0.483	1.000
R22	SKC	224-PCXR8	707444	05/04/2026	1,000	1,500	2,000	1,007	1,496	2,000	1.001x - 6.418	0.999
R23	SKC	224-PCXR8	761067	05/04/2026	1,000	1,500	2,000	1,001	1,502	2,004	1.002x - 1.446	1.000
R24	SKC	224-PCXR8	707893	03/04/2026	1,000	1,500	2,000	1,002	1,503	2,001	0.999x + 2.560	1.000
R25	SKC	224-PCXR8	761052	03/04/2026	1,000	1,500	2,000	1,009	1,504	2,005	0.997x + 4.106	0.999
R26	SKC	224-PCXR8	707956	05/04/2026	1,000	1,500	2,000	1,002	1,503	2,000	0.998x + 4.497	1.000
R27	SKC	224-PCXR8	707398	03/04/2026	1,000	1,500	2,000	1,001	1,505	2,004	1.003x - 1.921	1.000
R28	SKC	224-PCXR8	707481	05/04/2026	1,000	1,500	2,000	1,010	1,513	2,006	0.997x + 5.531	0.999
R29	SKC	224-PCXR8	707402	03/04/2026	1,000	1,500	2,000	1,003	1,502	1,992	1.003x - 10.216	0.999
R30	SKC	224-PCXR8	093811	05/04/2026	1,000	1,500	2,000	999	1,512	2,005	1.007x - 9.705	1.000
R31	SKC	224-PCXR8	093183	05/04/2026	1,000	1,500	2,000	1,011	1,510	2,011	1.001x + 2.983	0.999
R32	SKC	224-PCXR8	671950	03/04/2026	1,000	1,500	2,000	1,001	1,500	2,001	0.999x + 2.272	1.000
R33	SKC	224-PCXR4	626254	05/04/2026	1,000	1,500	2,000	998	1,507	2,002	1.005x - 10.975	1.000
R34	SKC	224-PCXR4	626131	05/04/2026	1,000	1,500	2,000	997	1,496	2,000	1.007x - 14.230	1.000
R35	SKC	224-PCXR8	707460	05/04/2026	1,000	1,500	2,000	998	1,509	1,996	1.000x - 2.915	1.000
R36	SKC	224-PCXR8	707446	05/04/2026	1,000	1,500	2,000	1,003	1,492	2,003	1.007x - 16.135	0.999
R37	SKC	224-PCXR8	707432	03/04/2026	1,000	1,500	2,000	999	1,507	2,005	1.003x - 6.095	1.000
R38	SKC	224-PCXR8	707349	03/04/2026	1,000	1,500	2,000	1,003	1,499	1,999	0.997x + 2.141	1.000
R39	SKC	224-PCXR8	761095	05/04/2026	1,000	1,500	2,000	1,005	1,508	2,004	1.000x - 0.152	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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S.P.S. CONSULTING SERVICE CO., LTD.

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature . 25 $\pm$ 3 $^{\circ}$ C
Pressure . 1010 $\pm$ 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	05/04/2026	1,000	1,500	2,000	1,004	1,497	2,000	0.998x + 1.430	1.000
R41	SKC	224-PCXR4	626140	03/04/2026	1,000	1,500	2,000	998	1,498	1,997	0.999x + 0.943	1.000
R42	SKC	224-PCXR4	626463	05/04/2026	1,000	1,500	2,000	1,005	1,513	1,998	0.997x + 4.138	0.999
R43	SKC	224-PCXR4	626129	03/04/2026	1,000	1,500	2,000	1,003	1,498	2,000	0.998x + 2.029	1.000
R44	SKC	224-PCXR4	602753	03/04/2026	1,000	1,500	2,000	996	1,509	1,997	1.003x - 8.036	1.000
R45	SKC	224-PCXR4	626137	05/04/2026	1,000	1,500	2,000	1,011	1,514	2,005	0.995x + 8.367	0.999

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)

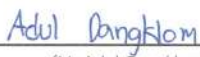


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 Tel : (662) 939-4370-72, Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter Model : Defender 510-H S/N : 136833

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-R01	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	499.7	1000.6	1996.7	1.000x - 0.544	1.000
H-R02	Dwyer	VFB-65	01/04/2026	500	1,000	2,000	501.2	992.4	1990.0	1.001x - 5.362	0.999
H-R03	Dwyer	VFB-65	03/04/2026	500	1,000	2,000	501.4	997.5	1997.3	0.998x + 2.606	1.000
H-R04	Dwyer	VFB-65	05/04/2026	500	1,000	2,000	502.5	993.6	1985.2	0.999x - 2.085	0.999
H-R05	Dwyer	VFB-65	05/04/2026	500	1,000	2,000	500.4	1001.3	1999.8	1.000x + 1.247	1.000
H-R06	Dwyer	VFB-65	03/04/2026	500	1,000	2,000	500.8	997.2	1994.6	0.999x - 0.348	1.000

Calibrated by :  (Mr. Abdul Dangklom)	Approved by :  (Mr. Peera Detudom)
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Tel : (662) 939-4370-72. Fax : (662) 513-4221. E-mail : sale@spscon.com., www.spscon.com

Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

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-R01	Dwyer	VFA-21	01/04/2026	50	100	200	50.3	101.1	201.9	0.998x + 0.955	1.000
L-R02	Dwyer	VFA-21	01/04/2026	50	100	200	50.2	101.7	201.0	0.999x + 0.367	0.999
L-R03	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	101.2	201.0	1.001x + 0.605	1.000
L-R04	Dwyer	VFA-21	05/04/2026	50	100	200	50.7	100.8	200.2	1.000x + 0.719	1.000
L-R05	Dwyer	VFA-21	05/04/2026	50	100	200	50.1	101.2	200.5	1.001x - 0.213	0.999
L-R06	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	100.8	200.1	0.999x + 0.639	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

SITHIPORN
associates



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 :

Nitinun Srihawan

Approved by :

Wichok B.
(Wichok Ekpongpradit)

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

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 2 of 4

Calibration Method :

This instrument was calibrated by using on-site calibration procedure In-house method : CP-SP-01

The calibration procedure to direct measurement wavelength accuracy by using wavelength standard solution, Photometric accuracy by using absorbance standard filter and absorbance standard solution

The calibration procedure used was based on ASTM E275-01, ASTM E925-02

Condition of this result of calibration :

1. Certified reference materials

<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</i>	<i>Pass</i>
<i>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)



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

Calibration Report			
Total Hydrocarbon Analyzer			
Date :	04 February 2026	Brand :	HORIBA
		Model :	APHA-360CE
No.	B01	Serial No.	4211954001
Calibrator (Dilution System)			
Brand :	Teledyne	Model :	700
Last Cal. Date :	24 October 2025	Serial No. :	421
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No. :	D612165
Certified Date :	25 February 2023	Expired Date :	25 February 2031
		Cylinder Conc. :	453 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
		% RH	50
		Start Time :	2:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.03	10
Calibration Setting (Final)			
Span Instrument Gain:	0.997	Finish Time:	3:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	912.3	mV	800-1,350
Signal (THC)	917.1	mV	800-1,350
Detector	78.0	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.3	kPa	8 - 25
NMC	258.5	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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S.P.S. CONSULTING SERVICE CO., LTD.

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

Calibration Report			
Total Hydrocarbon Analyzer			
Date :	05 May 2026	Brand :	HORIBA
		Model :	APHA-370
No.	R01	Serial No.	WDDDN38N
Calibrator (Dilution System)			
Brand :	Teledyne	Model :	700
Last Cal. Date :	24 October 2025	Serial No.	421
Reference Standard Gas			
Standard Gas :	Methane (CH ₄)	Cylinder No.	D612165
Certified Date :	25 February 2023	Expired Date :	25 February 2031
		Cylinder Conc.	453 ppm
Calibrating Condition			
Pressure	1011 mmbar	Temp.	24.6 °C
		% RH	50
		Start Time :	2:00 PM
Pre-Calibration Checks			
Change Particulate Filter	Yes	Station Temp :	25.0 °C
Leak Test	Yes		
Calibration Setting			
Span Set Point	Initial Reading (Before Adj)		Final Reading (After Adj)
	Expected Concentration (PPM)	Analyzer Response (PPM)	Analyzer Response (PPM)
Zero	0	-0.10	0
Span	10	10.03	10
Calibration Setting (Final)			
Span Instrument Gain:	0.998	Finish Time:	3:00 PM
APHA-360 Total Hydrocarbon Analyzer			
Test Values	Observed Value	Units	Nominal Range
Signal (CH ₄)	910.8	mV	800-1,350
Signal (THC)	915.1	mV	800-1,350
Detector	78.0	kPa	((Pressure Air/1013)x100)-20 ± 4 kPa
Purifier	19.2	kPa	8 - 25
NMC	258.6	°C	260 ± 10
Bypass	0.9	L / min	0.9 ± 0.3
Over Flow	0.8	L / Min	0.8

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับความร้อนในสถานประกอบการ



Certificate of Calibration

Certificate Number : SPR26010387-1

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Quest Technologies

Model : QUESTemp 34

Serial Number : TEH090208

ID. Number : R08

Environmental Conditions

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

Received Date : 30 Jan 2026

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

Calibration Date : 03 Feb 2026

Location of Calibration : In-Lab

Recommend Due Date : 03 Feb 2027

Calibration Procedure : SP-CPT-04-13

Date of Issue : 04 Feb 2026

Method of Calibration

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

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

Calibrated by : Mr.Jirasak Pumbut

Approved by

Calibration Officer



(Mr.Worapong Sinthusopa)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR26010387-1

Page : 2 of 3

Reference Standards

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

Traceability

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

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR26010387-1

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.7	-0.309	0.20
35.0	35.012	34.7	-0.312	0.20
40.0	40.017	39.7	-0.317	0.21

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.6	-0.409	0.20
35.0	35.012	34.6	-0.412	0.20
40.0	40.017	39.6	-0.417	0.21

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.7	-0.309	0.20
35.0	35.012	34.7	-0.312	0.20
40.0	40.017	39.7	-0.317	0.21

Note :

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR25100063-3

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Metrosonics

Model : hs-32

Serial Number : MCD070028

ID. Number : R06

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPT-04-13

Received Date : 06 Oct 2025

Calibration Date : 08 Oct 2025

Recommend Due Date : 08 Oct 2026

Date of Issue : 09 Oct 2025

Method of Calibration

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

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

Calibrated by : Mr. Navaporn Uengseng

Approved by

Calibration Officer



(Mr. Pootthipong A.)

Authorized Signatory

SP-FM-04-15 rev.0



Calibration Report

Certificate Number : SPR25100063-3

Page : 2 of 3

Reference Standards

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

Traceability

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

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR25100063-3

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

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

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

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

Temperature Accuracy in the Measurement. (GLOVE)

Unit : °C

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

Note :

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

Measurement Uncertainty

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

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR26010387-2

Page : 1 of 3

Customer : S.P.S. CONSULTING SERVICE CO., LTD.

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

Equipment Name : Area Heat Stress Monitor

Manufacturer : Metrosonics

Model : hs-32

Serial Number : MCD070035

ID. Number : R05

Environmental Conditions

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

Received Date : 30 Jan 2026

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

Calibration Date : 03 Feb 2026

Location of Calibration : In-Lab

Recommend Due Date : 03 Feb 2027

Calibration Procedure : SP-CPT-04-13

Date of Issue : 04 Feb 2026

Method of Calibration

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

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

Calibrated by : Mr. Jirasak Pumbut

Approved by

Calibration Officer



(Mr. Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR26010387-2

Page : 2 of 3

Reference Standards

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

Traceability

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

NA - NA Caltechnologies Co., Ltd.

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



Result of Calibration

Certificate Number : SPR26010387-2

Page : 3 of 3

Temperature Accuracy in the Measurement. (WET)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.7	-0.309	0.20
35.0	35.012	34.7	-0.312	0.20
40.0	40.017	39.7	-0.317	0.21

Temperature Accuracy in the Measurement. (DRY)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.7	-0.309	0.20
35.0	35.012	34.7	-0.312	0.20
40.0	40.017	39.7	-0.317	0.21

Temperature Accuracy in the Measurement. (GLOBE)

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty (±)
30.0	30.009	29.7	-0.309	0.20
35.0	35.012	34.7	-0.312	0.20
40.0	40.017	39.7	-0.317	0.21

Note :

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

Measurement Uncertainty

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

- End of Certificate -



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

Heat R026

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No. :	R05	Verification Date :	09 April 2026
Brand :	METROSONICS	Ambient Temp. :	24.5 °C
Model :	hs-32	Barometric Pressure :	1011 mmbar
Serial No. :	MCD070035	Relative Humidity :	48 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : <u>21</u> WB = <u>12.5</u> °C, DB = <u>47.1</u> °C, G = <u>69.3</u> °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by : _____
(Mr.Heeson Lormae)

Approved by : _____
(Mr.Yutthana Tanathanit)



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

Heat R026

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No. :	R06	Verification Date :	09 April 2026
Brand :	METROSONICS	Ambient Temp. :	24.5 °C
Model :	hs-32	Barometric Pressure :	1011 mmbar
Serial No. :	MCD070028	Relative Humidity :	48 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : 21 WB = 12.5 °C, DB = 47.1 °C, G = 69.3 °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by : _____
(Mr.Heeson Lormae)

Approved by : _____
(Mr.Yutthana Tanathanit)



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

Heat R026

Heat Stress WBGT Meter Verification Report			
Verification Data			
Heat Stress WBGT Meter No. :	R08	Verification Date :	09 April 2026
Brand :	Quest Technologies	Ambient Temp. :	24.5 °C
Model :	QUESTemp 34	Barometric Pressure :	1011 mmbar
Serial No. :	TEH090208	Relative Humidity :	48 %
Verification Module (Electronic Sensor Check) :			
Verification Module No. : <u>21</u> WB = <u>12.5</u> °C, DB = <u>47.1</u> °C, G = <u>69.3</u> °C			
Result of Verification : Without Adjustment			
Wet Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
12.5	12.6	-0.1	± 0.5
Dry Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
47.1	47.2	-0.1	± 0.5
Globe Probe Temperature Measurement			
Verification Module Reading (°C)	UUC* Reading (°C)	Correction (°C)	Tolerance Limit (°C)
69.3	69.2	0.1	± 0.5
UUC* = UNIT UNDER CALIBRATION			

Verified by : _____
(Mr.Heeson Lormae)

Approved by : _____
(Mr.Yutthana Tanathanit)

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงในสถานประกอบการ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

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

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

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

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

Date of Receipt : 29 Jan. 2026

Date of Calibration : 11 Feb. 2026

1 / 2

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

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

Head Office

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

Office/Laboratory

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

Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-69/0204

MTC No. EEL. BP. 152/0169

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

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

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 11 Feb. 2026

Date of Issue : 12 Feb. 2026

Ref : 2011269012900497001

End of Certificate

2 / 2

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

FM.BL.MTC.002 Rev.5

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, .
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E-mail : mtc@tistr.or.th Website : www.tistr.or.th

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

Noise R_100/26

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-R40	ACO	6236	00192052	23 February 2026	93.9	93.9
ACO-R41	ACO	6236	00192053	23 February 2026	93.9	93.9
ACO-R50	ACO	6236	00192062	23 February 2026	93.9	93.9
ACO-R51	ACO	6236	00192063	23 February 2026	93.9	93.9
ACO-R52	ACO	6236	00192064	23 February 2026	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Heeson L

(Mr. Heeson Lormae)

Approved by :

Yutthana T

(Mr. Yutthana Tanatharanit)

เอกสารสอบเทียบเครื่องมือการตรวจวัดระดับเสียงสะสมแบบติดตัวบุคคล



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0514

MTC No. EEL. BP. 34/0868

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : SVANTEK

Model : SV34

Serial No. : 83820

Ambient Environment

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

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

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

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

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

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

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

Date of Receipt : 14 Aug. 2025

Date of Calibration : 22 Aug. 2025

1 / 2

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

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.5

Head Office

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Fax. (66) 0 2577 9009

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(66) 08 1889 6827

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0514

MTC No. EEL. BP. 34/0868

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

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

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

1. Sound Pressure Level

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

2. Frequency

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

3. Total Distortion

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

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)



Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 22 Aug. 2025

Date of Issue : 25 Aug. 2025

Ref : 2011268081403169011

End of Certificate

2 / 2

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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

Noise Dose R_099/26

Noise Dose Meter Calibration Report

Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 03/60
Model	SV34	Serial No.	83820
Calibration Range	114 dB, 1000 Hz	Last Calibration	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
NMD-B18	SVANTEK	SV-104IS	106123	23 February 2026	114.0	114.0
NMD-B19	SVANTEK	SV-104IS	106124	23 February 2026	114.0	114.0
NMD-B20	SVANTEK	SV-104IS	106131	23 February 2026	114.0	114.0
NMD-R02	SVANTEK	SV-104IS	60152	23 February 2026	114.0	114.0
NMD-R03	SVANTEK	SV-104IS	60153	23 February 2026	114.0	114.0
NMD-R06	SVANTEK	SV-104IS	60146	23 February 2026	114.0	114.0
NMD-R13	SVANTEK	SV-104IS	63438	23 February 2026	114.1	114.0
NMD-R22	SVANTEK	SV-104IS	80801	23 February 2026	114.0	114.0
NMD-R26	SVANTEK	SV-104IS	80836	23 February 2026	114.0	114.0
NMD-R35	SVANTEK	SV-104IS	80873	23 February 2026	114.1	114.0

Acoustic Certified Value : Thailand Institute of Scientific and Technological Research
(TISTR)

114.02± 0.10 dB

Calibrated by :

Heeson L.

(Mr. Heeson Lormae)

Approved by :

Yuthana J.

(Mr. Yuthana Tanatharanit)



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Noise Dose R_135/26

Noise Dose Meter Calibration Report

Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 03/60
Model	SV34	Serial No.	83820
Calibration Range	114 dB, 1000 Hz	Last Calibration	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
NMD-R02	SVANTEK	SV-104IS	60152	22 March 2026	114.0	114.0
NMD-R03	SVANTEK	SV-104IS	60153	22 March 2026	114.0	114.0
NMD-R06	SVANTEK	SV-104IS	60146	22 March 2026	114.0	114.0
NMD-R13	SVANTEK	SV-104IS	63438	22 March 2026	114.1	114.0
NMD-R22	SVANTEK	SV-104IS	80801	22 March 2026	114.0	114.0
NMD-R26	SVANTEK	SV-104IS	80836	22 March 2026	114.0	114.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					114.02± 0.10 dB	

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana J.
(Mr. Yutthana Tanatharanit)



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Noise Dose R_143/26

Noise Dose Meter Calibration Report

Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 03/60
Model	SV34	Serial No.	83820
Calibration Range	114 dB, 1000 Hz	Last Calibration	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
NMD-B20	SVANTEK	SV-104IS	106131	25 March 2026	114.0	114.0
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					114.02± 0.10 dB	

Calibrated by :

Heeson L.
(Mr. Heeson Lormae)

Approved by :

Yutthana J.
(Mr. Yutthana Tanatharanit)

เอกสารสอบเทียบเครื่องมือการตรวจการรับสัมผัสสารเคมี



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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 : 136833

Environmental Conditions

Temperature : 25 $\pm$ 3 $^{\circ}$ C
Pressure : 1010 $\pm$ 15 mmbar

Personal Pump Data					Calibration Data							
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)			y	R ²
					1	2	3	1	2	3		
R01	SKC	224-PCXR4	602467	01/04/2026	1,000	1,500	2,000	1,001	1,500	2,007	1.005x - 6.003	1.000
R02	SKC	224-PCXR4	626450	05/04/2026	1,000	2,000	3,000	1,000	1,503	2,001	1.001x - 0.383	1.000
R03	SKC	224-PCXR4	691592	03/04/2026	1,000	1,500	2,000	1,005	1,501	2,000	1.007x - 15.384	0.999
R04	SKC	224-PCXR4	691672	03/04/2026	1,000	1,500	2,000	1,007	1,513	1,999	0.996x + 5.855	0.999
R05	SKC	224-PCXR4	798470	05/04/2026	1,000	1,500	2,000	1,000	1,499	1,997	0.997x + 3.107	1.000
R06	SKC	224-PCXR4	798456	03/04/2026	1,000	1,500	2,000	998	1,497	1,996	0.998x + 0.120	1.000
R07	SKC	224-PCXR4	798480	05/04/2026	1,000	1,500	2,000	1,002	1,506	2,001	0.999x + 3.219	1.000
R08	SKC	224-PCXR4	883215	03/04/2026	1,000	1,500	2,000	1,004	1,501	1,992	1.003x - 9.877	0.999
R09	SKC	224-PCXR4	034650	03/04/2026	1,000	1,500	2,000	998	1,506	2,003	1.004x - 5.723	1.000
R10	SKC	224-PCXR4	091765	03/04/2026	1,000	1,500	2,000	999	1,507	1,996	1.005x - 13.080	0.999
R11	SKC	224-PCXR4	091763	05/04/2026	1,000	1,500	2,000	1,001	1,504	2,001	1.000x + 0.104	1.000
R12	SKC	224-PCXR4	091568	03/04/2026	1,000	1,500	2,000	998	1,505	1,996	0.998x + 1.482	1.000
R13	SKC	224-PCXR4	091638	03/04/2026	1,000	1,500	2,000	1,001	1,504	2,000	0.999x + 2.097	1.000
R14	SKC	224-PCXR4	091764	05/04/2026	1,000	1,500	2,000	1,007	1,506	2,001	1.004x - 8.866	0.999
R15	SKC	224-PCXR8	529457	05/04/2026	1,000	1,500	2,000	998	1,492	1,999	1.001x - 6.322	1.000
R16	SKC	224-PCXR8	529643	03/04/2026	1,000	1,500	2,000	1,004	1,506	2,004	1.007x - 11.726	0.999
R17	SKC	224-PCXR8	529645	05/04/2026	1,000	1,500	2,000	998	1,503	1,998	1.000x - 0.703	1.000
R18	SKC	224-PCXR8	566756	03/04/2026	1,000	1,500	2,000	999	1,508	1,995	1.002x - 8.012	0.999
R19	SKC	224-PCXR8	566802	05/04/2026	1,000	1,500	2,000	998	1,502	1,998	1.000x - 0.823	1.000
R20	SKC	224-PCXR8	529089	03/04/2026	1,000	1,500	2,000	999	1,503	1,996	0.997x + 2.001	1.000
R21	SKC	224-PCXR8	665728	03/04/2026	1,000	1,500	2,000	998	1,505	1,999	1.000x - 0.483	1.000
R22	SKC	224-PCXR8	707444	05/04/2026	1,000	1,500	2,000	1,007	1,496	2,000	1.001x - 6.418	0.999
R23	SKC	224-PCXR8	761067	05/04/2026	1,000	1,500	2,000	1,001	1,502	2,004	1.002x - 1.446	1.000
R24	SKC	224-PCXR8	707893	03/04/2026	1,000	1,500	2,000	1,002	1,503	2,001	0.999x + 2.560	1.000
R25	SKC	224-PCXR8	761052	03/04/2026	1,000	1,500	2,000	1,009	1,504	2,005	0.997x + 4.106	0.999
R26	SKC	224-PCXR8	707956	05/04/2026	1,000	1,500	2,000	1,002	1,503	2,000	0.998x + 4.497	1.000
R27	SKC	224-PCXR8	707398	03/04/2026	1,000	1,500	2,000	1,001	1,505	2,004	1.003x - 1.921	1.000
R28	SKC	224-PCXR8	707481	05/04/2026	1,000	1,500	2,000	1,010	1,513	2,006	0.997x + 5.531	0.999
R29	SKC	224-PCXR8	707402	03/04/2026	1,000	1,500	2,000	1,003	1,502	1,992	1.003x - 10.216	0.999
R30	SKC	224-PCXR8	093811	05/04/2026	1,000	1,500	2,000	999	1,512	2,005	1.007x - 9.705	1.000
R31	SKC	224-PCXR8	093183	05/04/2026	1,000	1,500	2,000	1,011	1,510	2,011	1.001x + 2.983	0.999
R32	SKC	224-PCXR8	671950	03/04/2026	1,000	1,500	2,000	1,001	1,500	2,001	0.999x + 2.272	1.000
R33	SKC	224-PCXR4	626254	05/04/2026	1,000	1,500	2,000	998	1,507	2,002	1.005x - 10.975	1.000
R34	SKC	224-PCXR4	626131	05/04/2026	1,000	1,500	2,000	997	1,496	2,000	1.007x - 14.230	1.000
R35	SKC	224-PCXR8	707460	05/04/2026	1,000	1,500	2,000	998	1,509	1,996	1.000x - 2.915	1.000
R36	SKC	224-PCXR8	707446	05/04/2026	1,000	1,500	2,000	1,003	1,492	2,003	1.007x - 16.135	0.999
R37	SKC	224-PCXR8	707432	03/04/2026	1,000	1,500	2,000	999	1,507	2,005	1.003x - 6.095	1.000
R38	SKC	224-PCXR8	707349	03/04/2026	1,000	1,500	2,000	1,003	1,499	1,999	0.997x + 2.141	1.000
R39	SKC	224-PCXR8	761095	05/04/2026	1,000	1,500	2,000	1,005	1,508	2,004	1.000x - 0.152	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

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-R01	Dwyer	VFA-21	01/04/2026	50	100	200	50.3	101.1	201.9	0.998x + 0.955	1.000
L-R02	Dwyer	VFA-21	01/04/2026	50	100	200	50.2	101.7	201.0	0.999x + 0.367	0.999
L-R03	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	101.2	201.0	1.001x + 0.605	1.000
L-R04	Dwyer	VFA-21	05/04/2026	50	100	200	50.7	100.8	200.2	1.000x + 0.719	1.000
L-R05	Dwyer	VFA-21	05/04/2026	50	100	200	50.1	101.2	200.5	1.001x - 0.213	0.999
L-R06	Dwyer	VFA-21	03/04/2026	50	100	200	50.3	100.8	200.1	0.999x + 0.639	1.000

Calibrated by :

Adul Dangklom
 (Mr. Adul Dangklom)

Approved by :

Peera Detudom
 (Mr. Peera Detudom)



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.





บริษัท ไทยยูนิค จำกัด

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

APPROVAL :

Signature:

Engineer : Somchai Pohtongkam

Date : 02/08/2025



VARIAN



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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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	<i>Sachin P.</i>	
Date	02/08/2025	



Comments			
Reviewed by	<i>Wattana</i>	Date	02/08/2025



VARIAN



บริษัท ไทยยูนิค จำกัด

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	<i>Somchai P.</i>	
Date	02/08/2025	



Comments			
Reviewed by	<i>Wattana</i>	Date	02/08/2025



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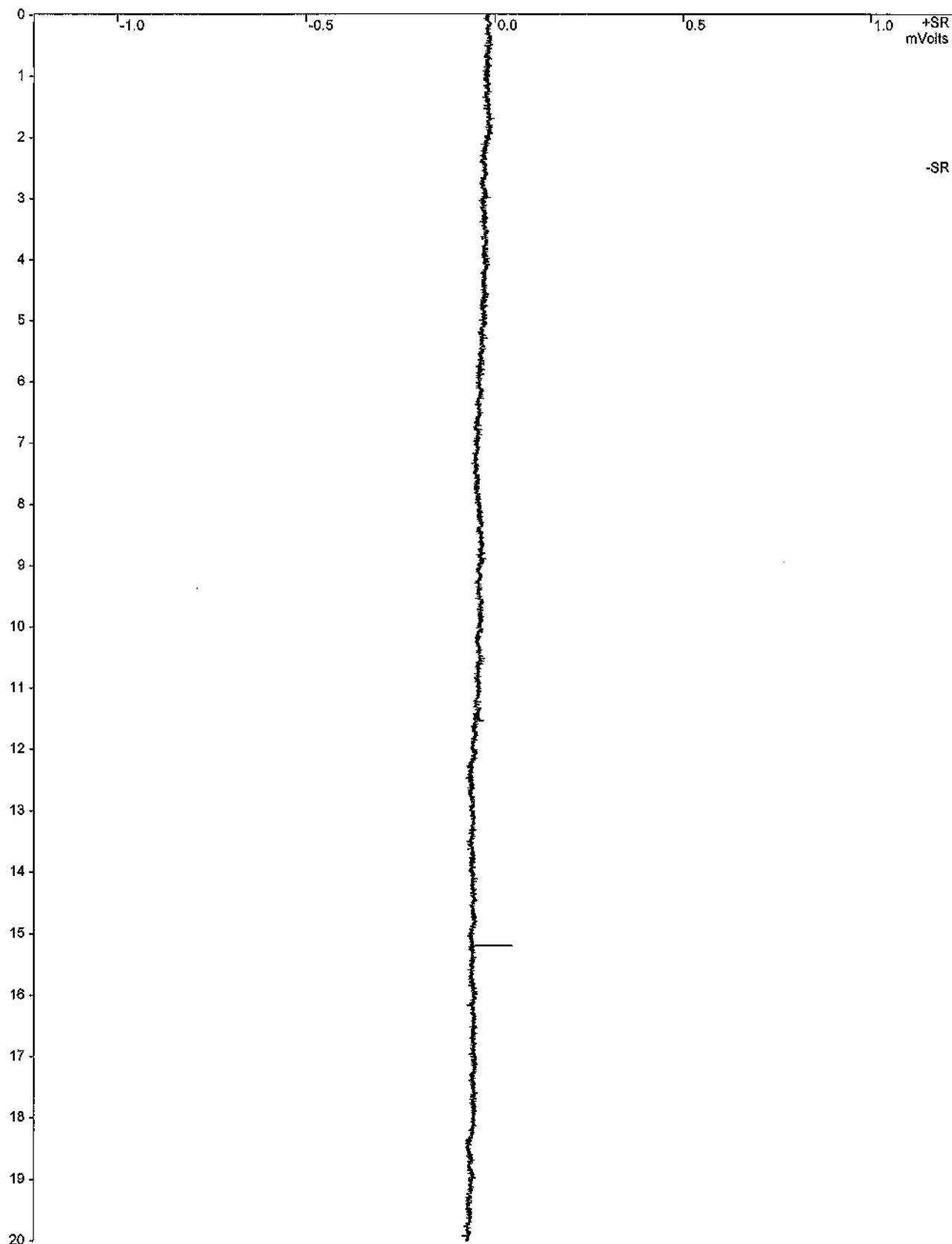
Title :
Run File : e:\sps2025\blk001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : blk

Injection Date: 2/8/2568 12:01 Calculation Date: 2/8/2568 12:33

Operator : watsamon Detector Type: 3800 (10 Volts)
Workstation: GC-LAB Bus Address : 44
Instrument : Sample Rate : 10.00 Hz
Channel : Front = FID Run Time : 20.005 min

** LC Workstation Version 6.20 ** 02511-7390-ae7-0265 **

Chart Speed = 1.13 cm/min Attenuation = 1 Zero Offset = 50%
Start Time = 0.000 min End Time = 20.005 min Min / Tick = 1.00



Title :
Run File : e:\sps2025\blk001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : blk

Injection Date: 2/8/2568 12:01 Calculation Date: 2/8/2568 12:33

Operator : watsamon Detector Type: 3800 (10 Volts)
Workstation: GC-LAB Bus Address : 44
Instrument : Sample Rate : 10.00 Hz
Channel : Front = FID Run Time : 20.005 min

** LC Workstation Version 6.20 ** 02511-7390-ae7-0265 **

Run Mode : Analysis
Peak Measurement: Peak Area
Calculation Type: External Standard

Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
Totals:		0.0000		0.000	0			

Total Unidentified Counts : 0 counts

Detected Peaks: 0 Rejected Peaks: 0 Identified Peaks: 0

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: -14 microVolts LSB: 1 microVolts

Noise (used): 24 microVolts - monitored before this run

Manual injection

Data Handling: No peaks

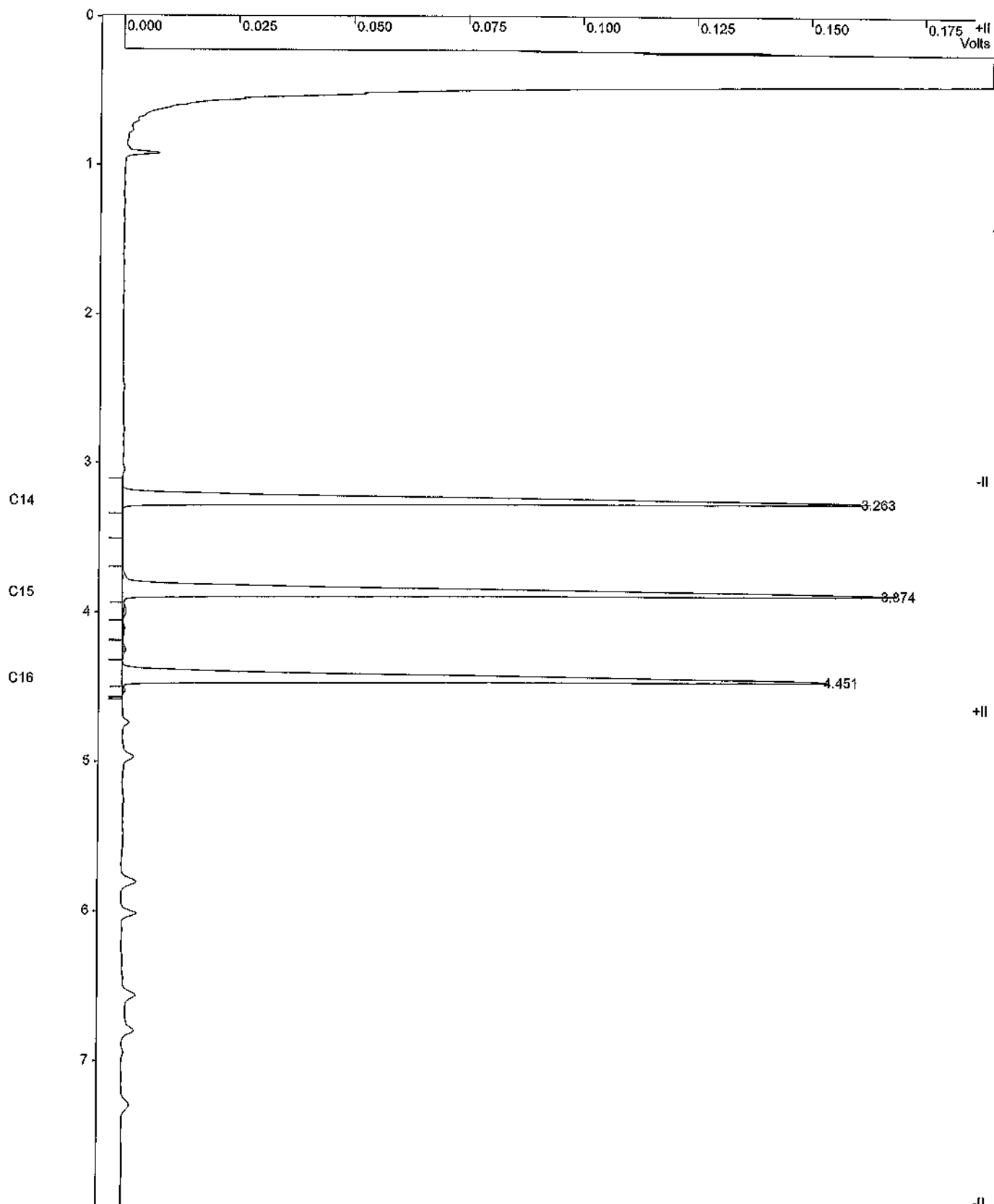
Title :
Run File : e:\sps2025\fidstd001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : fidstd

Injection Date: 2/8/2568 12:34 Calculation Date: 2/8/2568 13:26

Operator : watsamon Detector Type: 3800 (10 Volts)
Workstation: GC-LAB Bus Address : 44
Instrument : Sample Rate : 10.00 Hz
Channel : Front = FID Run Time : 7.993 min

** LC Workstation Version 6.20 ** 02511-7390-ae7-0265 **

Chart Speed = 2.83 cm/min Attenuation = 79 Zero Offset = 2%
Start Time = 0.000 min End Time = 7.993 min Min / Tick = 1.00



Title :
Run File : e:\sps2025\fidstd001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : fidstd

Injection Date: 2/8/2568 12:34 Calculation Date: 2/8/2568 13:26

Operator : watsamon Detector Type: 3800 (10 Volts)
Workstation: GC-LAB Bus Address : 44
Instrument : Sample Rate : 10.00 Hz
Channel : Front = FID Run Time : 7.993 min

** LC Workstation Version 6.20 ** 02511-7390-ae7-0265 **

Run Mode : Calibration
Peak Measurement: Peak Area
Calculation Type: External Standard
Level : 1

Peak No.	Peak Name	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1	C14	3.263	0.002	458627	BB	2.7	
2	C15	3.874	0.002	506043	VV	2.8	
3	C16	4.451	0.001	460610	VB	2.8	
Totals:			0.005	1425280			

Total Unidentified Counts : 0 counts

Detected Peaks: 8 Rejected Peaks: 5 Identified Peaks: 3

Multiplier: N/A Divisor: N/A Unidentified Peak Factor: 0

Baseline Offset: 6 microVolts LSB: 1 microVolts

Noise (used): 2 microVolts - monitored before this run

Manual injection

Sample ID: fid std

Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):



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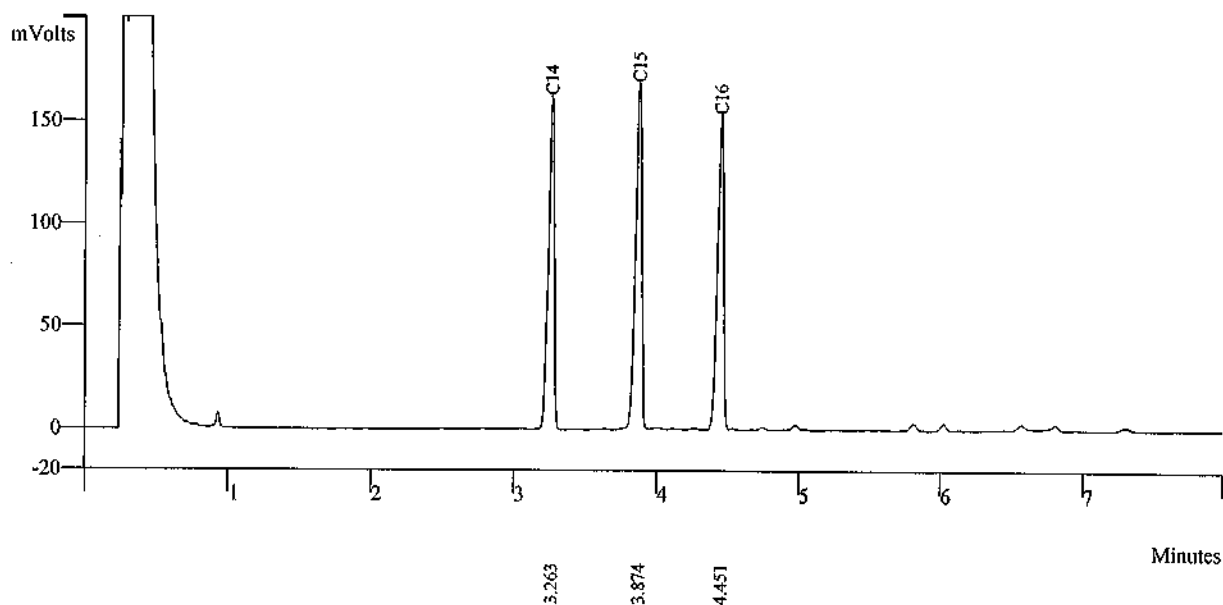
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd001.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	0.0000	3.263	458627	BB	2.7
2	C15	0.0000	3.874	506043	VV	2.8
3	C16	0.0000	4.451	460610	VB	2.8
	Totals	0.0000		1425280		

Sample ID: fid std



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Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):

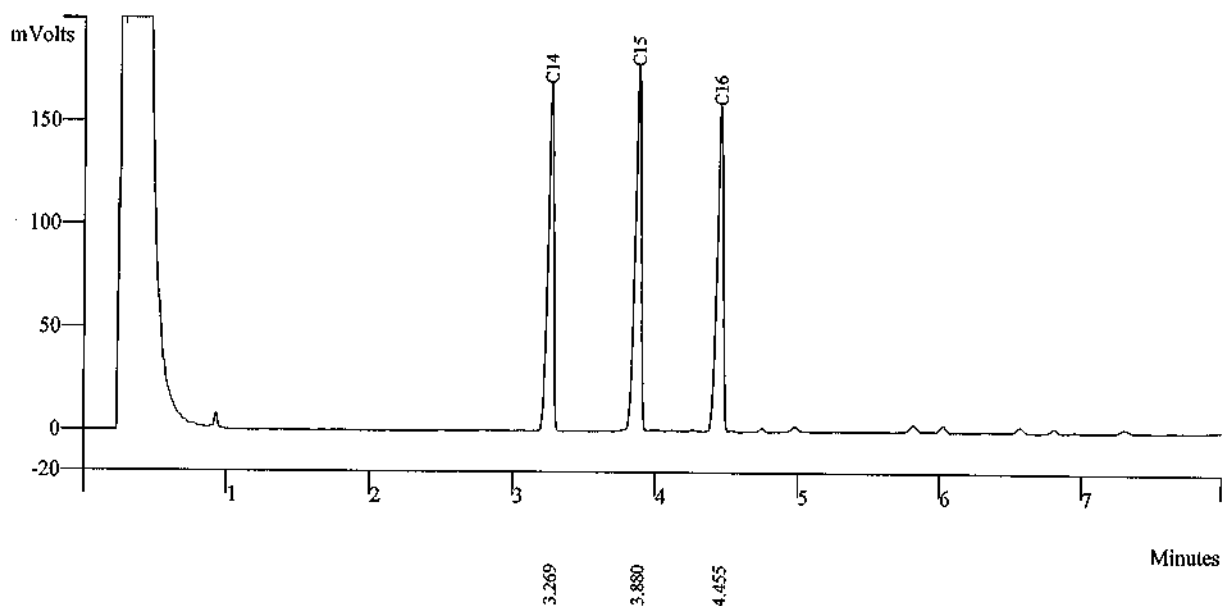
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd002.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	0.0000	3.269	472338	BB	2.6
2	C15	0.0000	3.880	520497	VV	2.7
3	C16	0.0000	4.455	471916	VB	2.8
	Totals	0.0000		1464751		



Sample ID: fid std

Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):



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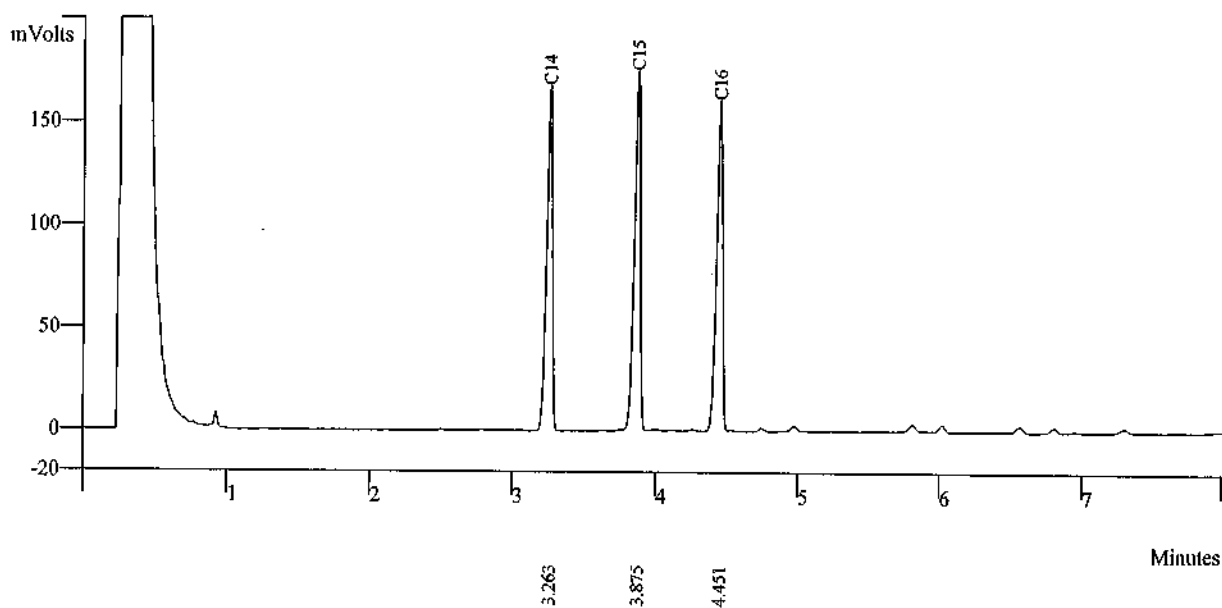
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd003.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	0.0000	3.263	469265	BB	2.6
2	C15	0.0000	3.875	522154	VV	2.8
3	C16	0.0000	4.451	478526	VB	2.8
	Totals	0.0000		1469945		

Sample ID: fid std



Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):

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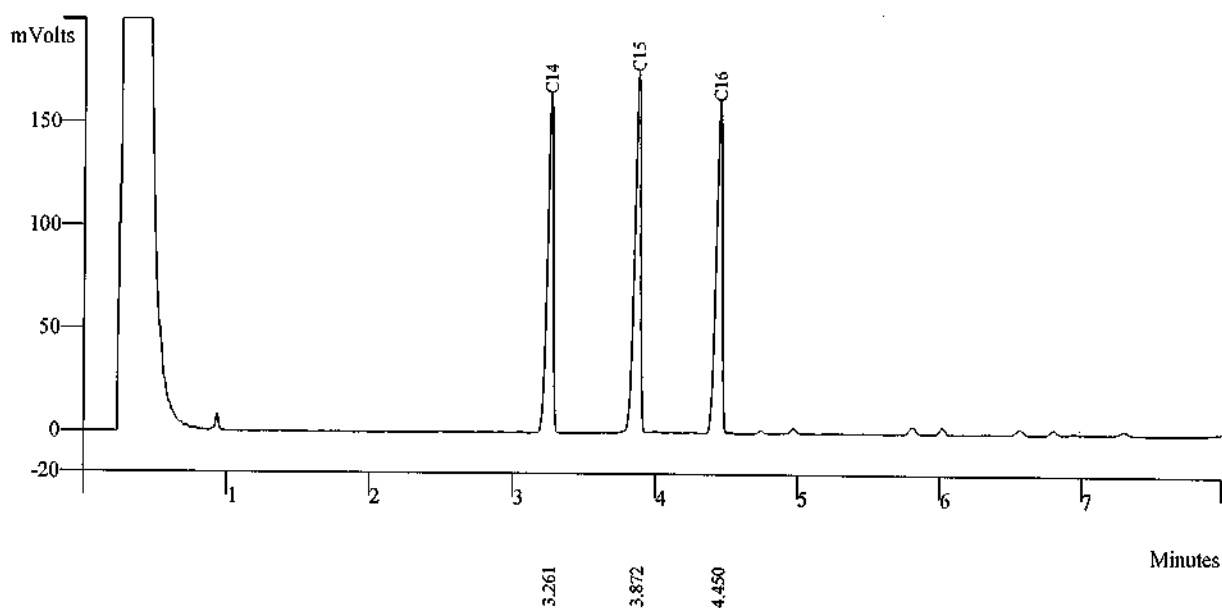
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd004.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	0.0000	3.261	468907	BB	2.7
2	C15	0.0000	3.872	521664	VV	2.8
3	C16	0.0000	4.450	478772	VB	2.8
	Totals	0.0000		1469343		

Sample ID: **fid std**

Operator (Inj): **watsamon**

Injection Date: **02/08/2025**

Calc Date: **02/08/2025**

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):



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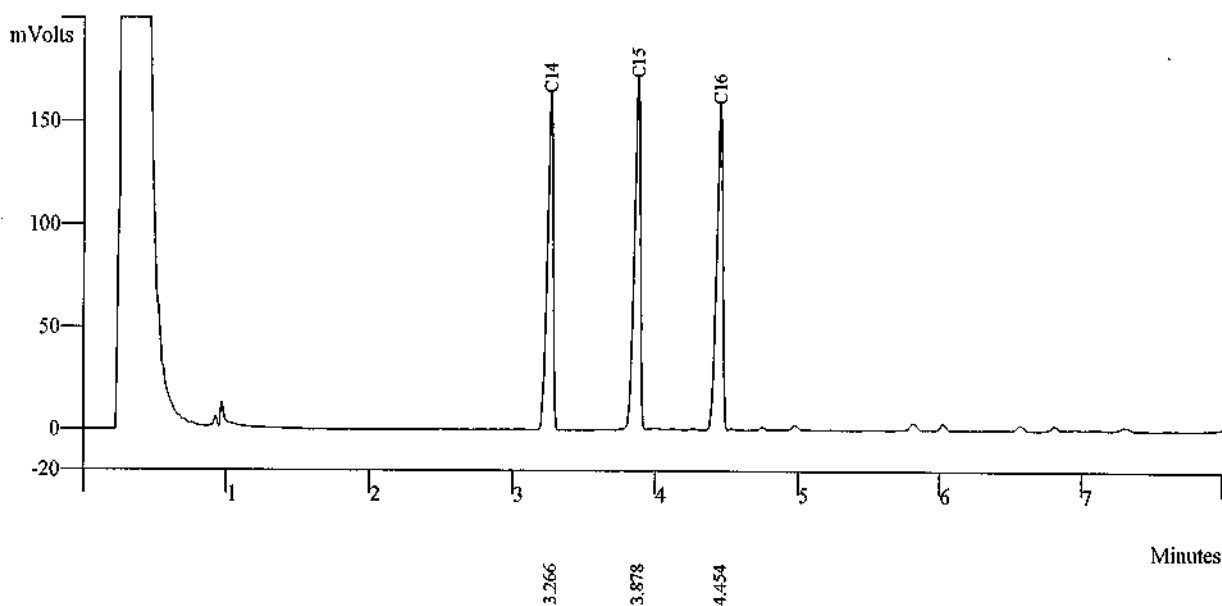
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd005.run

A = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	0.0000	3.266	459351	BB	2.6
2	C15	0.0000	3.878	509340	VV	2.8
3	C16	0.0000	4.454	468353	VB	2.8
	Totals	0.0000		1437044		



C14

External Standard Analysis

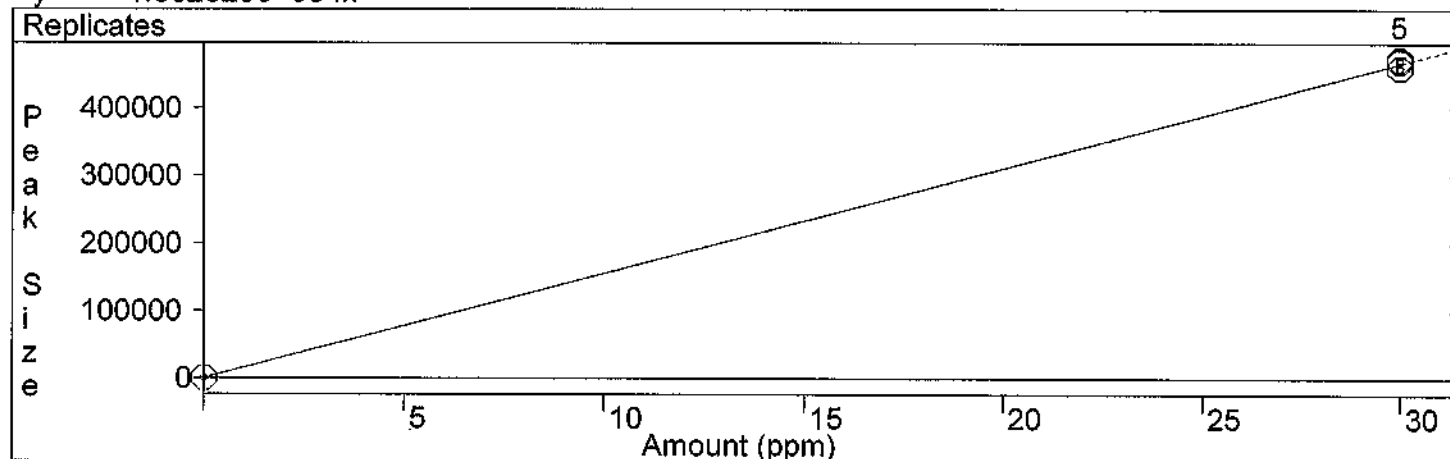
Curve Type: Linear

Origin: Force

$y = +1.552325e+004x$

Resp. Fact. RSD: 1.347%

Coeff. Det. (r^2): 0.999130



C15

External Standard Analysis

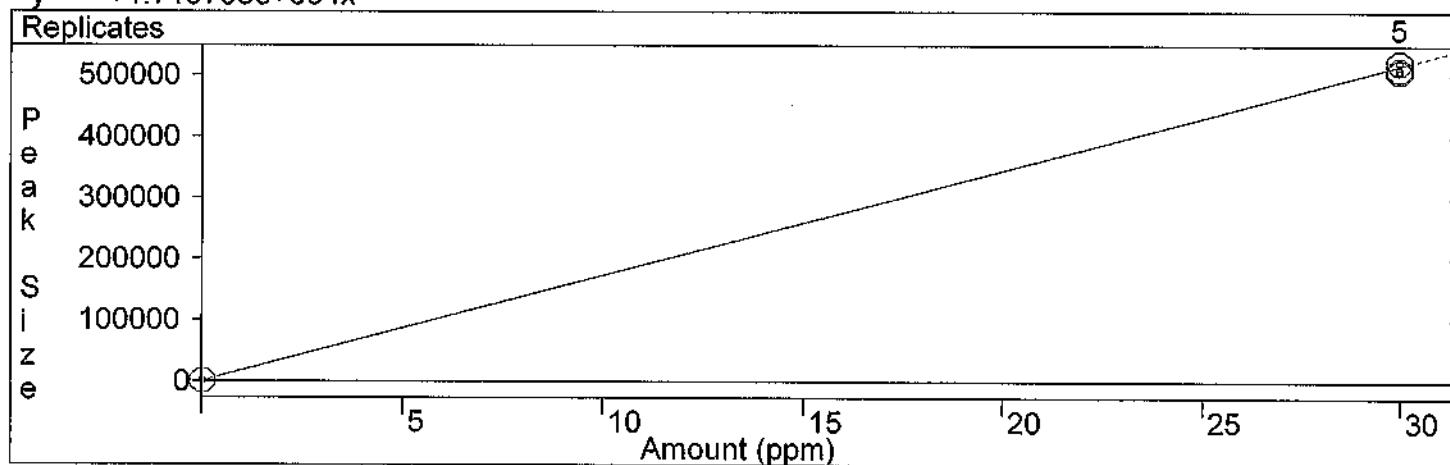
Curve Type: Linear

Origin: Force

$y = +1.719798e+004x$

Resp. Fact. RSD: 1.481%

Coeff. Det. (r^2): 0.998948



C16

External Standard Analysis

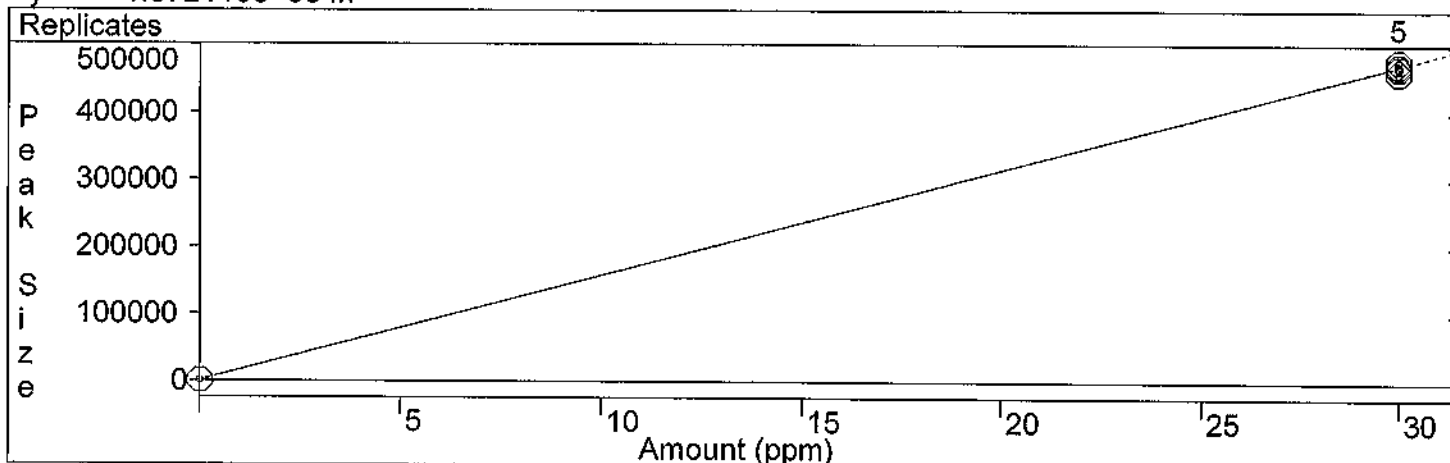
Curve Type: Linear

Origin: Force

$y = +1.572118e+004x$

Resp. Fact. RSD: 1.611%

Coeff. Det. (r^2): 0.998756



CERTIFICATE

This is to certify, that

Somchai Pohthongkham

has participated the course

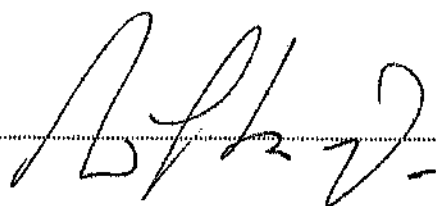
Basic GC and Sampler training

Date: ***24 – 27 May 2004***

Location: ***Middelburg***

Instructor: ***W.J. Buys***

Signature instructor:



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Varian Chrompack International BV
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Tel. +66 2993 4773, +66 2153 7132-3 Fax. +66 2994 5509 E-mail : wk.calibrations@gmail.com www.wk-etc.com

Certificate of Calibration

Certificate No.: WK2412-053-1

Page 1 of 2

Customer : THAI UNIQUE CO., LTD.
80-82 Prachathipatai Rd., Bangkhunphrom,
Pranakorn, Bangkok 10200

Instrument : AMD Flow Meter
Manufacturer : Agilent Technologies
Model : G6691A
Serial No. : MY16470347
Identity No. : SV-DF-001
Range : 0 ml/min to 750 ml/min
Resolution : See to Data
Calibration Method : CP-WK-M10

Ambient Temperature : $(23 \pm 2) ^\circ\text{C}$
Humidity : $(50 \pm 15) \% \text{RH}$
Received Date : 4-Dec-24
Calibrated Date : 11-Dec-24
Issued Date : 13-Dec-24
Calibrated Location : In Lab

Reference standard instruments :

<u>Instrument</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Flow Calibrator	140215-134	L202304114-001	18-Apr-25	MIT
Primary Flow Calibrator	1107-S	WK2405-049-5	22-May-25	WK Electric Co., Ltd.

MIT : Miracle International Technology Co., Ltd.

This result calibrate was found accurate as shown on date place of calibrate only

This certificate is traceability to the International System of Unit (SI)

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%

Calibrated by : Mr.Thippatai Mungpungklang

Approved by :

Ms. Budsagorn Patcha

Authorized Signatory

This certificate may not be reproduced except in full unless permission for the reproduction has been obtained in writing from the laboratory.



Measuretronix Limited
2425/2 Lat Phrao Road, Saphan Song
Wangthonglang, Bangkok 10310, Thailand
Phone : 0-2514-1000, 0-2514-1234
Fax : 0-2514-0001, 0-2514-0003
Website : www.measuretronix.com



Certificate of Calibration

Certificate Number : LF25-0305
Equipment : Thermometer
Manufacturer : Fluke
Model : 51
Serial Number : 5910857
Asset Number : 5910857
Customer : Thal Unique Co., Ltd.
80-82 Prachathipatal Road,
Bangkhunphrom, Pranakorn,
Bangkok 10200
Date of Calibrate : 6-Jun-2025
Date of Issue : 6-Jun-2025

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

This calibration certificate applies only to the item identified and shall not be reproduced other than in full, without specific written approved by Measuretronix Cal-Lab. Calibration certificates without signature are not valid.

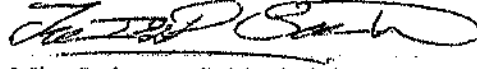
The measurements marked with an asterisk () in this certificate are outside our range of accreditation. They have been included for completeness.*

The Calibration interval (Cal.Due) is the responsibility of the end user.

Calibrated by


Mr. Samak Uaonkaonoi
Metrology Technician

Approved by


Miss Juthamas Sukhathainirun
Cal-Lab Manager



Agilent Technologies

Certificate of Analysis

FID-TCD Performance Evaluation Sample Kit

Agilent Part
Number: 5080-8842, 18710-60170

Sample Lot
Number: 0006750304

This analytical reference material was manufactured and verified in accordance with an ISO 9001 registered quality system, and the analyte concentrations were verified by an ISO 17025 accredited laboratory. The certified value for each analyte was determined gravimetrically.

Concentrations:

n-tetradecane	0.218 g/L ($\pm 0.5\%$)	0.033 w/w %
n-pentadecane	0.218 g/L ($\pm 0.5\%$)	0.033 w/w %
n-hexadecane	0.218 g/L ($\pm 0.5\%$)	0.033 w/w %

Solvent: hexane

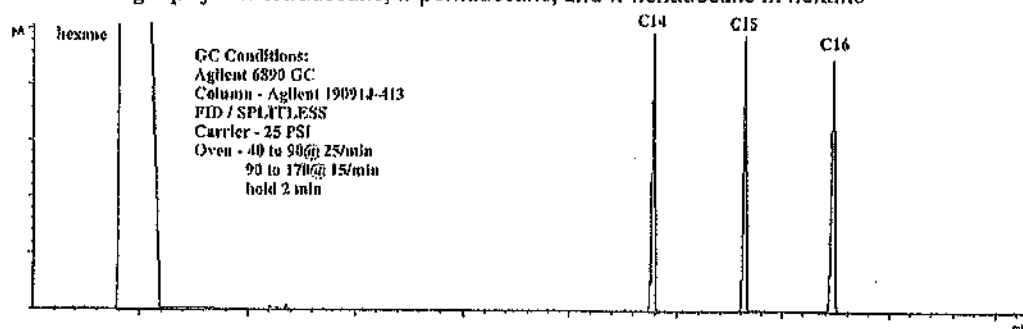
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Purities:

n-tetradecane	99.6%
n-pentadecane	99%
n-hexadecane	99.5%
hexane	99%

Typical Analytical Spectrum or Chromatography

GC Chromatography – n-tetradecane, n-pentadecane, and n-hexadecane in hexane



Date of release: 30 June 2023

Date of expiration: 31 July 2025

Monica Bourgeois
Monica Bourgeois
QMS Representative