

# ภาคผนวกที่ 4

## เอกสารสอบเทียบความถูกต้องของเครื่องมือ

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากปล่อง

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศในบรรยากาศ

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำเสีย

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำผิวดิน

เอกสารสอบเทียบการตรวจวัดระดับเสียงที่ขอบเขตรั้วพื้นที่โรงงาน

เอกสารสอบเทียบการตรวจวัดระดับเสียงในพื้นที่ทำงาน

เอกสารสอบเทียบการตรวจวัดคุณภาพอากาศในสถานที่ทำงาน

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวิเคราะห์	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>1. คุณภาพอากาศจากปล่อง</b>		
Total Suspended Particulate	Console No. R01, R07 Pitot Tube No. B21, B38	Digital Balance
NO <sub>x</sub>	Vacuum Gauge	Spectrophotometer
SO <sub>2</sub>	Personal Pump SKC No. B16, B68 Rotameter No.B01, R02	-
CO	CO Analyzer	CO Analyzer
Acrylonitrile	Mass Flow Meter	GC/FID
Styrene	Mass Flow Meter	GC/FID
1, 3 Butadiene	Mass Flow Meter	GC/FID
Alpha Methyl Styrene	Mass Flow Meter	GC/FID
<b>2. คุณภาพอากาศในบรรยากาศ</b>		
NO <sub>x</sub>	NO <sub>2</sub> Analyzer	NO <sub>2</sub> Analyzer
SO <sub>2</sub>	SO <sub>2</sub> Analyzer	SO <sub>2</sub> Analyzer
<b>3. คุณภาพน้ำทิ้ง</b>		
pH	-	pH Meter
Temperature	-	Thermometer
TDS	-	Digital Balance
SS	-	Digital Balance
BOD <sub>5</sub>	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Acrylonitrile	-	GC/MS
Styrene monomer	-	GC/MS



**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง  
และเครื่องมือวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวิเคราะห์	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
<b>4. คุณภาพน้ำผิวดิน</b>		
pH	-	pH Meter
TDS	-	Digital Balance
TSS	-	Digital Balance
BOD <sub>5</sub>	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Acrylonitrile	-	GC/MS
Styrene monomer	-	GC/MS
<b>5. ระดับเสียงที่ขอบรั้วพื้นที่โครงการ</b>		
L <sub>eq</sub> 24 hr	Acoustic Calibrator Sound Level Meter No. ACO- R19, R15, R21, R22	-
<b>6. ระดับเสียงในสถานประกอบการ</b>		
L <sub>eq</sub> 8 hr และ Octave Band	Acoustic Calibrator Sound Level Meter No. ACO- B33, B36, B41, B43, R40	-
Noise Dose	Acoustic Calibrator Sound Level Meter No. NMD- B01, B02, B03, B04, B05, B06, B07, B10, B11, B12, B13, B14, B15, B16, B17, B20, R22, R26,	-
<b>7. คุณภาพอากาศในสถานประกอบการ</b>		
Acrylonitrile	Personal Pump SKC No. B16, B24 Rotameter No. H-R01	GC/MS
Styrene	Personal Pump SKC No. B24, B26 Rotameter No. H-R01	GC/MS
1, 3 Butadiene	Personal Pump SKC No. B17, R22 Rotameter No. L-R02	GC/FID
Alpha Methyl Styrene	Personal Pump SKC No. R21, R25 Rotameter No. L-R01	GC/FID

เอกสารสอบเทียบเครื่องมือการตรวจวัดคุณภาพอากาศจากปล่อง



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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

## Console Calibration Report

Calibration Method

Critical Orifices

### Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	DH <sub>g</sub> (mmH <sub>2</sub> O)
B01	1563	03/03/2025	1.003	49.40
B02	8002514	03/03/2025	1.004	49.57
B03	1503016	04/03/2025	0.999	49.93
B04	00006659	04/03/2025	0.996	49.88
B05	00007428	04/03/2025	1.007	49.14
R01	1561	05/03/2025	0.996	49.32
R02	8002513	04/03/2025	1.003	49.96
R03	1570	04/03/2025	0.998	50.08
R04	8002519	03/03/2025	0.997	49.53
R05	1503015	05/03/2025	1.005	50.25

Remark : Accept Value of y (test) is  $0.97 < y < 1.03$

Accept Value of DH<sub>g</sub> (test) is  $46.7 \pm 6.4$  (mmH<sub>2</sub>O)

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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## Console Calibration Report

Calibration Method

Critical Orifices

### Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	DH <sub>g</sub> (mmH <sub>2</sub> O)
B01	1563	02/06/2025	0.997	49.56
B02	8002514	04/06/2025	0.998	49.74
B03	1503016	02/06/2025	1.007	49.69
B04	00006659	04/06/2025	0.999	50.11
B05	00007428	02/06/2025	1.006	49.65
R01	1561	04/06/2025	1.003	49.70
R02	8002513	03/06/2025	0.998	49.82
R03	1570	03/06/2025	1.005	49.88
R04	8002519	02/06/2025	1.004	49.76
R05	1503015	04/06/2025	0.997	50.04

Remark : Accept Value of y (test) is  $0.97 < y < 1.03$

Accept Value of DH<sub>g</sub> (test) is  $46.7 \pm 6.4$  (mmH<sub>2</sub>O)

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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## Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

### Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B03	S	0.99	01/05/2025	0.84	0.83
B04	S	0.99	01/05/2025	0.84	0.84
B05	S	0.99	01/05/2025	0.85	0.84
B07	S	0.99	01/05/2025	0.84	0.83
B08	S	0.99	01/05/2025	0.85	0.84
B09	S	0.99	02/05/2025	0.83	0.84
B11	S	0.99	01/05/2025	0.84	0.85
B16	S	0.99	01/05/2025	0.84	0.84
B18	S	0.99	01/05/2025	0.84	0.83
B19	S	0.99	01/05/2025	0.85	0.84
B21	S	0.99	02/05/2025	0.84	0.84
B24	S	0.99	05/05/2025	0.85	0.84
B27	S	0.99	05/05/2025	0.85	0.84
B30	S	0.99	05/05/2025	0.84	0.85
B31	S	0.99	05/05/2025	0.84	0.84
B33	S	0.99	01/05/2025	0.84	0.85
B35	S	0.99	01/05/2025	0.84	0.84

Remark : Accept value of Cp (test) is  $0.84 \pm 0.01$

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)





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## Pitot Tube Calibration Report

Calibration Method

Standard Pitot Tube

### Calibration Data

Pitot Tube Data			Calibration Data		
No.	Type of Pitot	Coefficient of Standard Pitot	Date	Avg. of Cp (test)	
				Side A	Side B
B36	S	0.99	01/05/2025	0.84	0.84
B37	S	0.99	01/05/2025	0.84	0.83
B38	S	0.99	01/05/2025	0.85	0.84
B39	S	0.99	01/05/2025	0.85	0.84
B40	S	0.99	01/05/2025	0.84	0.83
B41	S	0.99	01/05/2025	0.85	0.84
B44	S	0.99	01/05/2025	0.84	0.84
B45	S	0.99	02/05/2025	0.84	0.84
B46	S	0.99	02/05/2025	0.84	0.83
B47	S	0.99	02/05/2025	0.83	0.84
B48	S	0.99	02/05/2025	0.85	0.84
B49	S	0.99	01/05/2025	0.84	0.84
B54	S	0.99	01/05/2025	0.84	0.85
B56	S	0.99	01/05/2025	0.85	0.84
B57	S	0.99	01/05/2025	0.84	0.84
B58	S	0.99	05/05/2025	0.83	0.84

Remark : Accept value of Cp (test) is  $0.84 \pm 0.01$

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

## CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : VACUUM GAUGE  
MANUFACTURER : HI-LIGHT  
MODEL / TYPE : N/A  
SERIAL NO. : N/A[64-220066-2]  
CLID. NO. : 212201113  
JOB CONTROL NO. : 240730078440  
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

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

DATE OF RECEIVED : 30 July 2024

DATE OF ISSUED : 02 August 2024

The report of 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  
02 August 2024



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. Q24078440

F3-011-05/12-23

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## REPORT OF CALIBRATION

### FOR

NOMENCLATURE	:	VACUUM GAUGE
MANUFACTURER	:	HI-LIGHT
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[64-220066-2]
DATE OF CALIBRATION	:	31 July 2024
DUE DATE OF CALIBRATION	:	31 July 2025

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#### 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 741B S/N. 8295020 with Pressure Module Model 700PD5 S/N. 89404505.

#### TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).  
Certificate No. MP-0040-24, Due Date 08 February 2025.

#### 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%.

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**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

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

## CALIBRATION DATA

### **CORRECTION OF PRESSURE**

DUC Test point ( inHg )	STD Reading ( kPa )		Conversion to inHg		Correction ( inHg )	
	Up	Down	Up	Down	Up	Down
0	0.000	0.000	0.0	0.0	0.0	0.0
-5	-16.591	-16.930	-4.9	-5.0	+0.1	0.0
-10	-33.521	-33.521	-9.9	-9.9	+0.1	+0.1
-15	-50.113	-50.113	-14.8	-14.8	+0.2	+0.2
-20	-66.704	-67.043	-19.7	-19.8	+0.3	+0.2
-25	-83.634	-83.973	-24.7	-24.8	+0.3	+0.2
-30	-100.564	-100.564	-29.7	-29.7	+0.3	+0.3

Uncertainty of measurement  $\pm 0.2$  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. Q24078440

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### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

#### Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B01	SKC	224-PCXR4	262101	01/04/2025	1,000	1,500	2,000	998	1,494	2,002	1.001x - 3.594	1.000
B02	SKC	224-PCXR4	626166	01/04/2025	1,000	1,500	2,000	995	1,508	2,003	1.008x - 12.605	1.000
B03	SKC	224-PCXR4	612968	03/04/2025	1,000	1,500	2,000	1,003	1,502	2,006	1.006x - 7.796	1.000
B04	SKC	224-PCXR4	602804	03/04/2025	1,000	1,500	2,000	1,001	1,499	2,013	1.004x - 7.060	0.999
B05	SKC	224-PCXR4	612693	03/04/2025	1,000	1,500	2,000	1,004	1,498	2,007	1.003x - 2.455	1.000
B06	SKC	224-PCXR4	262188	03/04/2025	1,000	1,500	2,000	1,003	1,512	2,004	1.000x + 0.696	1.000
B07	SKC	224-PCXR4	626262	03/04/2025	1,000	1,500	2,000	1,012	1,504	1,996	0.994x + 10.330	0.999
B08	SKC	224-PCXR4	626100	02/04/2025	1,000	1,500	2,000	996	1,511	2,007	1.010x - 14.048	1.000
B09	SKC	224-PCXR4	626479	03/04/2025	1,000	1,500	2,000	999	1,510	2,003	1.003x - 4.677	1.000
B10	SKC	224-PCXR4	091950	03/04/2025	1,000	1,500	2,000	1,002	1,498	2,004	1.004x - 6.544	1.000
B11	SKC	224-PCXR8	564315	04/04/2025	1,000	1,500	2,000	1,013	1,505	2,010	1.002x + 2.171	1.000
B12	SKC	224-PCXR4	034656	04/04/2025	1,000	1,500	2,000	1,004	1,506	2,009	1.008x - 9.391	1.000
B13	SKC	224-PCXR4	602073	03/04/2025	1,000	1,500	2,000	1,001	1,497	2,012	1.009x - 9.643	1.000
B14	SKC	224-PCXR4	626313	03/04/2025	1,000	1,500	2,000	1,004	1,515	1,997	1.002x - 1.275	0.999
B15	SKC	224-PCXR4	626474	03/04/2025	1,000	1,500	2,000	999	1,497	1,996	1.000x - 2.511	1.000
B16	SKC	224-PCXR4	626477	03/04/2025	1,000	1,500	2,000	1,012	1,504	2,007	0.997x + 8.160	1.000
B17	SKC	224-PCXR4	626860	01/04/2025	1,000	1,500	2,000	997	1,506	1,999	1.001x - 1.435	1.000
B18	SKC	224-PCXR4	691484	02/04/2025	1,000	1,500	2,000	1,007	1,493	2,005	0.998x + 4.350	1.000
B19	SKC	224-PCXR4	691599	03/04/2025	1,000	1,500	2,000	1,004	1,513	2,001	1.003x - 2.043	1.000
B20	SKC	224-PCXR4	691587	03/04/2025	1,000	1,500	2,000	999	1,504	1,998	0.999x + 0.556	1.000
B21	SKC	224-PCXR4	691531	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,997	1.003x - 7.572	0.999
B22	SKC	224-PCXR4	691654	04/04/2025	1,000	1,500	2,000	1,008	1,504	2,006	1.005x - 4.941	1.000
B23	SKC	224-PCXR4	798393	04/04/2025	1,000	1,500	2,000	995	1,499	1,998	1.002x - 4.953	1.000
B24	SKC	224-PCXR4	626363	04/04/2025	1,000	1,500	2,000	1,002	1,501	1,996	0.999x - 1.539	1.000
B25	SKC	224-PCXR4	798489	04/04/2025	1,000	1,500	2,000	1,010	1,515	2,001	0.990x + 16.203	0.999
B26	SKC	224-PCXR4	798479	03/04/2025	1,000	1,500	2,000	999	1,492	1,999	0.998x - 0.596	1.000
B27	SKC	224-PCXR4	691673	03/04/2025	1,000	1,500	2,000	996	1,498	2,002	1.004x - 6.496	1.000
B28	SKC	224-PCXR4	691570	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,994	0.993x + 8.068	1.000
B29	SKC	224-PCXR4	626472	03/04/2025	1,000	1,500	2,000	1,001	1,501	1,996	0.994x + 9.367	1.000
B30	SKC	224-PCXR4	691489	01/04/2025	1,000	1,500	2,000	996	1,507	2,003	1.006x - 12.489	1.000
B31	SKC	224-PCXR4	691509	02/04/2025	1,000	1,500	2,000	1,010	1,509	2,008	1.003x - 3.858	0.999
B32	SKC	224-PCXR4	091567	02/04/2025	1,000	1,500	2,000	996	1,497	1,997	0.998x - 0.764	1.000
B33	SKC	224-PCXR4	091756	03/04/2025	1,000	1,500	2,000	998	1,508	2,006	1.007x - 13.441	0.999
B34	SKC	224-PCXR4	612962	03/04/2025	1,000	1,500	2,000	1,004	1,494	1,995	0.993 + 8.471	1.000
B35	SKC	224-PCXR4	602682	03/04/2025	1,000	1,500	2,000	999	1,491	2,001	1.000x - 2.275	1.000
B36	SKC	224-PCXR4	626164	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,997	0.995x + 5.109	1.000
B37	SKC	224-PCXR4	626256	03/04/2025	1,000	1,500	2,000	998	1,503	1,996	0.996x + 5.729	1.000
B38	SKC	224-PCXR4	626167	03/04/2025	1,000	1,500	2,000	996	1,509	2,004	1.008x - 15.248	0.999
B39	SKC	224-PCXR4	034637	02/04/2025	1,000	1,500	2,000	1,006	1,505	2,010	1.011x - 15.064	0.999
B40	SKC	224-PCXR4	798349	03/04/2025	1,000	1,500	2,000	997	1,510	2,008	1.012x - 19.381	1.000

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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B41	SKC	224-PCXR4	612669	03/04/2025	1,000	1,500	2,000	1,005	1,502	2,004	1.005x - 8.923	1.000
B42	SKC	224-PCXR4	626041	03/04/2025	1,000	1,500	2,000	1,004	1,501	2,008	1.009x - 13.856	1.000
B43	SKC	224-PCXR4	034636	01/04/2025	1,000	1,500	2,000	1,012	1,497	1,996	0.990x + 15.132	1.000
B44	SKC	224-PCXR8	529341	01/04/2025	1,000	1,500	2,000	1,011	1,511	2,008	1.002x - 0.860	0.999
B45	SKC	224-PCXR8	529594	04/04/2025	1,000	1,500	2,000	993	1,512	2,003	1.009x - 14.476	1.000
B46	SKC	224-PCXR8	566743	04/04/2025	1,000	1,500	2,000	1,008	1,508	2,008	1.000x - 0.100	0.999
B47	SKC	224-PCXR8	566747	04/04/2025	1,000	1,500	2,000	999	1,510	2,010	1.010x - 14.444	1.000
B48	SKC	224-PCXR8	566753	01/04/2025	1,000	1,500	2,000	1,010	1,506	2,006	0.999x + 2.782	1.000
B49	SKC	224-PCXR8	566780	04/04/2025	1,000	1,500	2,000	1,003	1,504	2,004	1.003x - 2.183	1.000
B50	SKC	224-PCXR8	500400	04/04/2025	1,000	1,500	2,000	1,002	1,493	1,995	0.994x + 5.841	1.000
B51	SKC	224-PCXR8	500363	04/04/2025	1,000	1,500	2,000	998	1,511	2,011	1.013x - 19.465	0.999
B52	SKC	224-PCXR8	093186	02/04/2025	1,000	1,500	2,000	997	1,505	2,006	1.008x - 12.641	1.000
B53	SKC	224-PCXR8	707670	02/04/2025	1,000	1,500	2,000	1,004	1,503	2,007	1.007x - 7.992	1.000
B54	SKC	224-PCXR3	509821	02/04/2025	1,000	1,500	2,000	1,005	1,504	2,008	1.010x - 15.060	0.999
B55	SKC	224-PCXR3	510710	02/04/2025	1,000	1,500	2,000	1,001	1,495	1,997	0.996x + 5.073	1.000
B56	SKC	224-PCXR3	511450	02/04/2025	1,000	1,500	2,000	1,005	1,494	1,996	0.991x - 13.385	1.000
B57	SKC	224-PCXR3	510798	03/04/2025	1,000	1,500	2,000	997	1,511	2,009	1.014x - 21.540	0.999
B58	SKC	224-PCXR3	509852	03/04/2025	1,000	1,500	2,000	1,006	1,493	2,002	1.001x - 4.094	1.000
B59	SKC	224-PCXR3	509862	03/04/2025	1,000	1,500	2,000	995	1,502	2,003	1.012x - 21.564	1.000
B60	SKC	224-PCXR3	512655	03/04/2025	1,000	1,500	2,000	998	1,507	2,004	1.010x - 18.510	0.999
B61	SKC	224-PCXR3	503915	03/04/2025	1,000	1,500	2,000	997	1,499	2,001	1.002x - 4.374	1.000
B62	SKC	224-PCXR3	505975	01/04/2025	1,000	1,500	2,000	1,002	1,503	2,005	1.008x - 11.138	1.000
B63	SKC	224-PCXR3	511432	04/04/2025	1,000	1,500	2,000	998	1,502	1,996	0.996x + 3.970	1.000
B64	SKC	224-PCXR3	508302	04/04/2025	1,000	1,500	2,000	1,005	1,509	2,008	1.009x - 10.402	1.000
B65	SKC	224-PCXR3	508310	04/04/2025	1,000	1,500	2,000	1,004	1,503	2,007	1.010x - 14.088	1.000
B66	SKC	224-PCXR3	509861	04/04/2025	1,000	1,500	2,000	1,003	1,504	2,010	1.008x - 12.369	1.000
B67	SKC	224-PCXR3	506295	04/04/2025	1,000	1,500	2,000	1,002	1,498	2,004	0.998x + 4.290	1.000
B68	SKC	224-PCXR3	505872	04/04/2025	1,000	1,500	2,000	999	1,504	1,998	1.000x + 0.436	1.000
B69	SKC	224-PCXR3	508375	02/04/2025	1,000	1,500	2,000	1,004	1,498	2,002	0.996x + 5.501	1.000
B70	SKC	224-PCXR3	510623	02/04/2025	1,000	1,500	2,000	996	1,497	2,005	1.005x - 8.735	1.000
B71	SKC	224-PCXR3	508367	02/04/2025	1,000	1,500	2,000	1,013	1,505	2,009	1.000x + 3.294	0.999
B72	SKC	224-PCXR3	505977	02/04/2025	1,000	1,500	2,000	997	1,494	2,003	1.006x - 11.350	1.000
B73	SKC	224-PCXR3	512606	01/04/2025	1,000	1,500	2,000	1,010	1,507	2,004	0.998x + 5.129	1.000
B74	SKC	224-PCXR3	505993	01/04/2025	1,000	1,500	2,000	998	1,499	2,010	1.009x - 11.942	1.000
B75	SKC	224-PCXR3	509820	01/04/2025	1,000	1,500	2,000	995	1,511	2,004	1.011x - 18.966	0.999
B76	SKC	224-PCXR3	509811	01/04/2025	1,000	1,500	2,000	998	1,504	2,010	1.012x - 20.993	0.999
B77	SKC	224-PCXR3	508301	03/04/2025	1,000	1,500	2,000	1,007	1,509	2,008	1.001x + 3.750	1.000
B78	SKC	224-PCXR3	510677	04/04/2025	1,000	1,500	2,000	998	1,508	2,001	1.003x - 3.278	1.000
B79	SKC	224-PCXR3	510920	04/04/2025	1,000	1,500	2,000	1,001	1,501	1,994	0.999x - 1.819	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

(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 : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
H-B01	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	499.1	997.5	1996.2	0.992x + 10.557	1.000
H-B02	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	501.5	996.9	2004.4	1.002x - 0.966	1.000
H-B03	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	498.9	997.4	1996.5	0.997x - 0.674	1.000
H-B04	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	498.0	996.5	2007.8	1.001x - 8.142	0.999
H-B05	Dwyer	VFB-65	02/04/2025	500	1,000	2,000	501.2	998.6	1993.7	0.994x + 6.199	1.000
H-B06	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	499.7	995.3	1989.1	0.995x + 1.374	0.999
H-B07	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	500.1	999.7	2006.4	0.998x - 1.014	1.000
H-B08	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	499.8	997.4	1994.8	0.993x + 6.689	1.000
H-B09	Dwyer	VFB-65	04/04/2025	500	1,000	2,000	498.2	997.1	2005.6	0.999x + 0.065	0.999
H-B10	Dwyer	VFB-65	04/04/2025	500	1,000	2,000	501.2	998.4	2009.2	0.998x + 3.713	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 : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
H-R01	Dwyer	VFB-65	02/04/2025	500	1,000	2,000	499.6	998.8	2004.8	1.001x - 3.678	1.000
H-R02	Dwyer	VFB-65	02/04/2025	500	1,000	2,000	501.7	997.1	1991.5	0.998x + 0.386	0.999
H-R03	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	499.8	999.7	1992.8	1.000x + 1.316	1.000
H-R04	Dwyer	VFB-65	04/04/2025	500	1,000	2,000	500.2	999.4	1989.2	0.999x + 1.870	0.999
H-R05	Dwyer	VFB-65	04/04/2025	500	1,000	2,000	499.9	1000.8	1994.5	1.000x + 0.815	1.000
H-R06	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	500.5	1001.3	1990.7	0.997x + 4.894	0.999

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)





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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

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 <sup>2</sup>
L-B01	Dwyer	VFA-21	01/04/2025	50	100	200	49.7	99.0	200.9	0.993x + 0.389	1.000
L-B02	Dwyer	VFA-21	03/04/2025	50	100	200	50.1	100.2	199.3	0.995x + 1.127	0.999
L-B03	Dwyer	VFA-21	04/04/2025	50	100	200	50.4	100.7	201.1	0.992x + 1.381	1.000
L-B04	Dwyer	VFA-21	01/04/2025	50	100	200	50.8	99.0	198.2	0.998x + 0.410	0.999
L-B05	Dwyer	VFA-21	02/04/2025	50	100	200	50.6	99.5	198.9	0.993x + 0.837	1.000
L-B06	Dwyer	VFA-21	03/04/2025	50	100	200	50.1	100.2	201.7	1.002x - 0.009	1.000
L-B07	Dwyer	VFA-21	03/04/2025	50	100	200	50.3	101.7	200.5	0.996x + 1.584	1.000
L-B08	Dwyer	VFA-21	01/04/2025	50	100	200	50.8	99.2	199.4	0.991x + 0.972	1.000
L-B09	Dwyer	VFA-21	04/04/2025	50	100	200	50.5	99.6	199.7	0.996x + 1.101	0.999
L-B10	Dwyer	VFA-21	04/04/2025	50	100	200	50.4	101.5	202.0	0.998x + 1.243	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 Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
L-R01	Dwyer	VFA-21	02/04/2025	50	100	200	50.7	101.0	199.3	0.995x + 1.197	1.000
L-R02	Dwyer	VFA-21	02/04/2025	50	100	200	49.8	100.7	199.1	1.001x - 0.303	1.000
L-R03	Dwyer	VFA-21	01/04/2025	50	100	200	50.1	101.2	200.9	1.005x - 0.447	0.999
L-R04	Dwyer	VFA-21	04/04/2025	50	100	200	50.2	100.9	201.5	0.994x + 1.311	1.000
L-R05	Dwyer	VFA-21	04/04/2025	50	100	200	50.4	100.7	201.6	0.999x + 0.781	1.000
L-R06	Dwyer	VFA-21	03/04/2025	50	100	200	49.8	101.2	201.8	1.003x - 0.149	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 :	01 May 2025	Brand :	API	Model :	300E
No.	CO-B01			Serial No.	782
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 28 October 2024			Serial No. : 201-S		
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 Set Point	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	40.07	0.175	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4013.1	mV	2500-4800 mV		
CO Reference	3948.8	mV	2500-4800 mV		
Measure/Reference Ratio	1.179	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.7	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	805	CC/Min	800 ± 10%		
Sample Temperature	48.3	°C	48 ± 4		
Bench Temperature	48.1	°C	48 ± 2		
Wheel Temperature	68.2	°C	68 ± 2		
Box Temperature	30.7	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3032.6	mV	250 mV to 4750 mV		
Slope	1.016	-	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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7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol, Chatuchak, Bangkok 10900

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

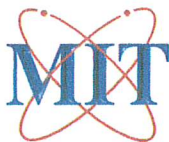
Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	01 May 2025	Brand :	API	Model :	300E
No.	CO-B06			Serial No.	3117
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 28 October 2024			Serial No. : 201-S		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.6	°C
				% RH	50
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	
Zero	0	0.10	-	0	
CO Span	40.00	39.94	-0.150	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4014.4	mV	2500-4800 mV		
CO Reference	3947.1	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	809	CC/Min	800 ± 10%		
Sample Temperature	48.5	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.4	°C	68 ± 2		
Box Temperature	30.9	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3028.3	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)



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkae Bangkok 10160

Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



## CALIBRATION CERTIFICATE

Page 1 of 4

Certificate No. : L202412119-0001

Date Issued : 13-Dec-24

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

**Equipment** : Mass Flow meter

**Manufacturer** : Dwyer

**Model** : GMF-2101

**Serial No.** : -

**ID No./Tag No.** : MF01/51

**Date Received** : 11-Dec-24

**Date Calibrated** : 12-Dec-24

**Calibrated by** : Saruth Srichutikul

### Calibration Method or Calibration Procedure Used

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

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

### Result of Calibration

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

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

Approved by:

*Sarayuth T.*  
(Sarayuth Tochua)



Certificate No. : L202412119-0001

Ambient Temperature :  $(25 \pm 2)^{\circ}\text{C}$

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

Capacity Range : 17 ml/min

Calibration Media : Air

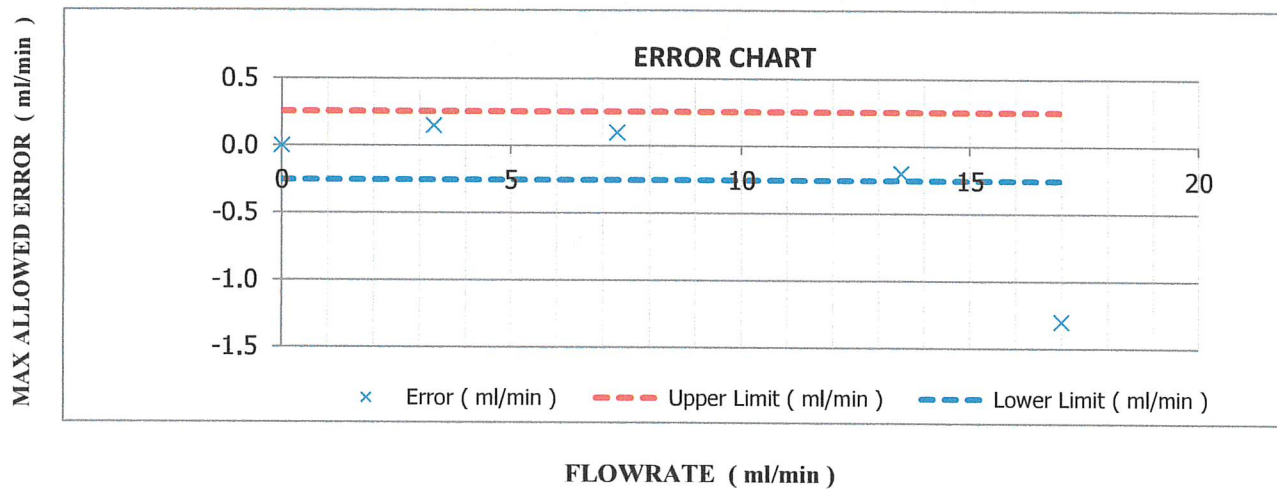
Type : Mass Flowmeter

Unit Under Calibration Reference Condition : Pressure 101.325 kPa(abs) ,  $21^{\circ}\text{C}$  , Nitrogen

#### Before Adjustment

Temperature ( $^{\circ}\text{C}$ )	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty ( $\pm$ ml/min)
24.00	100.46	0.00	0.000 *	0.000	0.063
24.10	100.62	3.30	3.149	0.151	0.13
24.10	100.78	7.30	7.2	0.10	0.14
24.20	101.07	13.50	13.7	-0.20	0.15
24.20	101.30	17.00	18.3	-1.30	0.19

Error = Unit Under Calibration - Standard



Certificate No. : L202412119-0001

Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

Capacity Range : 17 ml/min

Calibration Media : Air

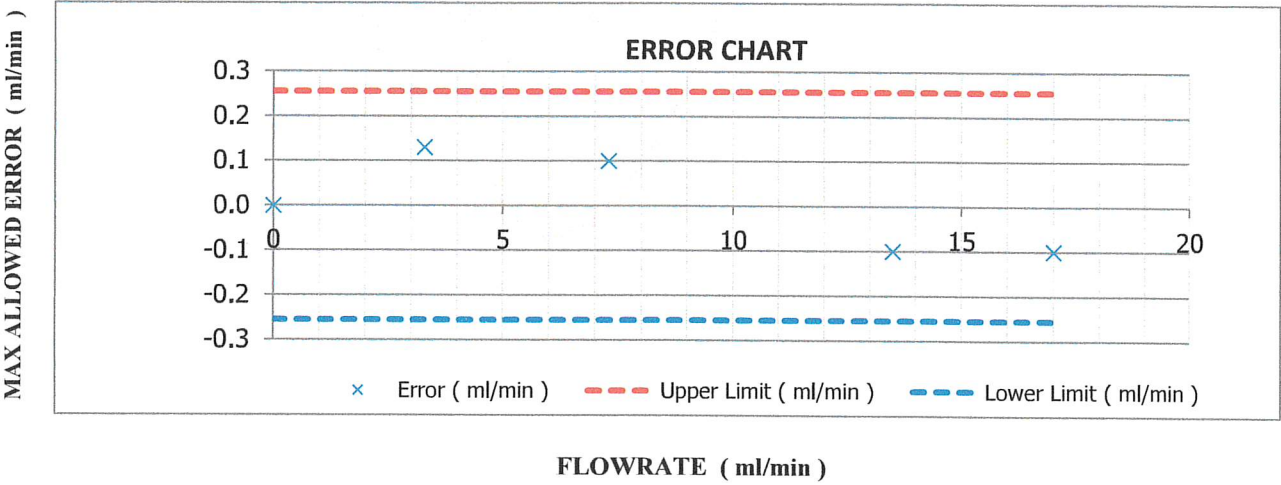
Type : Mass Flowmeter

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

After Adjustment

Temperature	Pressure	UUC Reading	STD Reading	Error	Uncertainty
( ° C )	( kPa )	( ml/min )	( ml/min )	( ml/min )	( ± ml/min )
24.00	100.45	0.00	0.000 *	0.000	0.063
24.10	100.62	3.30	3.170	0.130	0.13
24.10	100.78	7.30	7.2	0.10	0.14
24.20	101.01	13.50	13.6	-0.10	0.15
24.00	101.19	17.00	17.1	-0.10	0.18

Error = Unit Under Calibration - Standard



Certificate No. : L202412119-0001

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

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

; Q = Flow rate

; P = Absolute pressure

; T = Absolute temperature

; Subscript "Meas" = Measurement condition

; Subscript "Ref" = Reference condition

Condition As-Received : Used Item

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

**Traceability of Certificate :**

The International System of Units (SI) through

NIMT Certificate No. MW-0047-24, MW-0048-24 for Gas Flow meter Serial No. M5209179B/M5209179A, Due 03-Jul-25

**End of Certificate**





# 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](http://www.qcalibration.com)



CERTIFICATE No : 25M2254

REFERENCE No : 76365-1

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : METTLER TOLEDO

**MODEL** : XS105DU

**SERIAL No** : 1126422905

**ID No** : BA05/50

**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** : ATSAWIN Y.

**CALIBRATION DATE** : 07-Mar-25

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 13-Mar-25

**RECEIVED DATE** : 07-Mar-25

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







CERTIFICATE No : 25M2254

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : XS105DU  
MANUFACTURER : METTLER TOLEDO S/N : 1126422905  
ID No : BA05/50 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24° C  $\pm$  1° C RELATIVE HUMIDITY : 54 %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 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	0.01999	0.00001	0.000065
0.10	0.10001	-0.00001	0.000066
0.20	0.20001	-0.00001	0.000066
0.50	0.50002	-0.00002	0.000065
1.00	1.00003	-0.00003	0.000066
2.00	2.00001	-0.00001	0.000067
5.00	5.00002	-0.00002	0.000068
10.00	10.00000	0.00000	0.000070
20.00	20.00004	-0.00004	0.000078
50.00	50.00000	0.00000	0.00013
100.00	100.0001	-0.0001	0.00019
120.00	120.0002	-0.0002	0.00022

5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT





**Cert. No. : SP24020**

**Pages 1 of 3**

## Calibration Certificate

**Equipment :** UV-VIS SPECTROPHOTOMETER

**Manufacturer :** PERKINELMER

**Model :** LAMBDA 25

**Serial No.:** 501S14123010

**ID No.:** SP03/58

**Calibration Mode :** WAVELENGTH ACCURACY  
PHOTOMETRIC ACCURACY

**Condition As Found :** GOOD

**Customer :** S.P.S. CONSULTING SERVICE CO., LTD.  
7 SOI PHAHOLYOTHIN 24, PHAHOLYOTHIN ROAD,  
CHOMPHON, CHATUCHAK,  
BANGKOK 10900, THAILAND.

**Location :** WET CHEMISTRY LABORATORY IV

**Ambient Temperature :** ( 28.1  $\pm$  5 ) °C

**Relative Humidity :** ( 47.2  $\pm$  25 ) %

**Received Date :** 27 AUGUST 2024

**Calibration Date :** 27 AUGUST 2024

**Date of Issue :** 27 AUGUST 2024

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

  
( Thanakul Petchurai )



# SITHIPORN ASSOCIATES CO., LTD.

## CALIBRATION LABORATORY

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

SITHIPORN  
associates



Cert. No. : SP24020

Job No. : VC67SP0013

Pages : 2 of 3

### Calibration Method :

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

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

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

### Condition of this result of calibration :

#### 1. Certified reference materials

Material	Ref. type	Cell serial No.	Cert. No.	Due Date
Holmium liquid	RM-HL	29706	106864	01/11/2024
Didymium liquid	RM-DL	28912	106905	02/11/2024
Neutral density filter	RM-1N2N3N	13877	106918	03/11/2024
Potassium dichromate solutions	RM-0204060810	14204	106902	02/11/2024
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)

3.2 The National Institute of Standards and Technology, NIST.

### 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	278.3	0.17	0.16	2.00
	361.25	361.4	0.15	0.16	2.00
	467.82	467.7	-0.12	0.16	2.00
	536.56	536.5	-0.06	0.16	2.00
	640.50	640.4	-0.10	0.16	2.00
RM-DL	740.09	739.9	-0.19	0.16	2.00
	864.94	865.2	0.26	0.16	2.00

UUC\* = Unit Under Calibration

*G. Petch*

# 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. : SP24020

Job No. : VC67SP0013

Pages : 3 of 3

### Result of calibration : Photometric Accuracy

(Without adjustment)

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	29360	1.0	1.0517	1.0550	0.0033	0.0029	2.00
		29914	0.7	0.7445	0.7460	0.0015	0.0029	2.00
		29381	0.5	0.5416	0.5431	0.0015	0.0030	2.00
	546.1	29360	1.0	0.9821	0.9820	-0.0001	0.0028	2.00
		29914	0.7	0.6961	0.6958	-0.0003	0.0028	2.00
		29381	0.5	0.5073	0.5080	0.0007	0.0029	2.00
	590.0	29360	1.0	1.0222	1.0210	-0.0012	0.0028	2.00
		29914	0.7	0.7237	0.7221	-0.0016	0.0029	2.00
		29381	0.5	0.5361	0.5361	0.0000	0.0031	2.00
	635.0	29360	1.0	0.9753	0.9745	-0.0008	0.0028	2.00
		29914	0.7	0.6910	0.6900	-0.0010	0.0029	2.00
		29381	0.5	0.5211	0.5210	-0.0001	0.0032	2.00
Material	Wavelength (nm)	Solution (mg/l)	Certified Absorbance (A)	UUC* Reading Absorbance (A)	Error (A)	Uncertainty ± (A)	k Factor	
RM-0204060810	235.0	20	0.2422	0.2418	-0.0004	0.0101	2.00	
		40	0.4866	0.4852	-0.0014	0.0115	2.00	
		60	0.7414	0.7389	-0.0025	0.0067	2.00	
		80	0.9858	0.9842	-0.0016	0.0093	2.00	
		100	1.2442	1.2414	-0.0028	0.0086	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 0.0001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 1100 nm-190 nm

Scanning Speed 7.5 nm/min

Data Pitch 0.1 nm

Band width(Wavelength) 1.0 nm

Band width(Vis) 1.0 nm

Band width(Uv) 1.0 nm

Stray Light\*\* UUC\* Reading at 220 nm

Transmission T(%)	Absorbance(A)
0.0117	3.8659

\*\*Specific Acceptance :

Transmission  $\leq$  1.0 T(%), Absorbance  $\geq$  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

*T. Ketch*



## GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0824/22063

Instrument Type : Gas Chromatography

Model : CP-3800

Serial Number : 00734

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

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

Date : 05/08/2024

### ELECTRONIC TEST

CPU	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
LCD TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
VENT TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
KEY ECHO TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
DESTRUCTION RAM TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

### RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detector ( FID Channel Front)

INJECTOR : Capillary Injector Model 1079

#### 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 0.218 g/L C14, C15, C16 in hexane

SENSITIVITY TEST: C15. ( Area count ) = 156,955 Counts.





**Detector Sensitivity ( FID )**

Detector Response	Result	Specification
Baseline Noise ( $\mu$ V)	2.85	$\leq 50$
Baseline Drift (%)	0.09	$\leq 1$
Sensitivity ( S/N for C15)	16,400	$\geq 1,024$

**Temperature Specification**

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

**Relative Standard Deviation % ( % RSD)**

Checkout Procedure	Result	Specification
Area C15 ( %)	1.71	$\leq 5$
Retention Time C15( %)	0	$\leq 0.5$

APPROVAL :

Signature: Suwarot.Engineer : Suwarot TrikainutDate : 05/08/2024



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 Area 1	157,309
C15 Area 2	159,359
C15 Area 3	157,349
C15 Area 4	152,379
C15 Area 5	158,379
C15 Area Average	156,955
* % RSD ( < 5 % )	1.71

\* 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	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	Samarot.	
Date	05/08/2567	



Comments	-		
Reviewed by	Samar P.	Date	05/08/2024



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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	4.128
C15 RT 2	4.128
C15 RT 3	4.128
C15 RT 4	4.128
C15 RT 5	4.128
C15 RT Average	4.128
* % RSD ( < 0.5 % )	0

\* 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	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	Sunnarot.	
Date	05/08/2024	



Comments	-		
Reviewed by	Sunnarot P.	Date	05/08/2024



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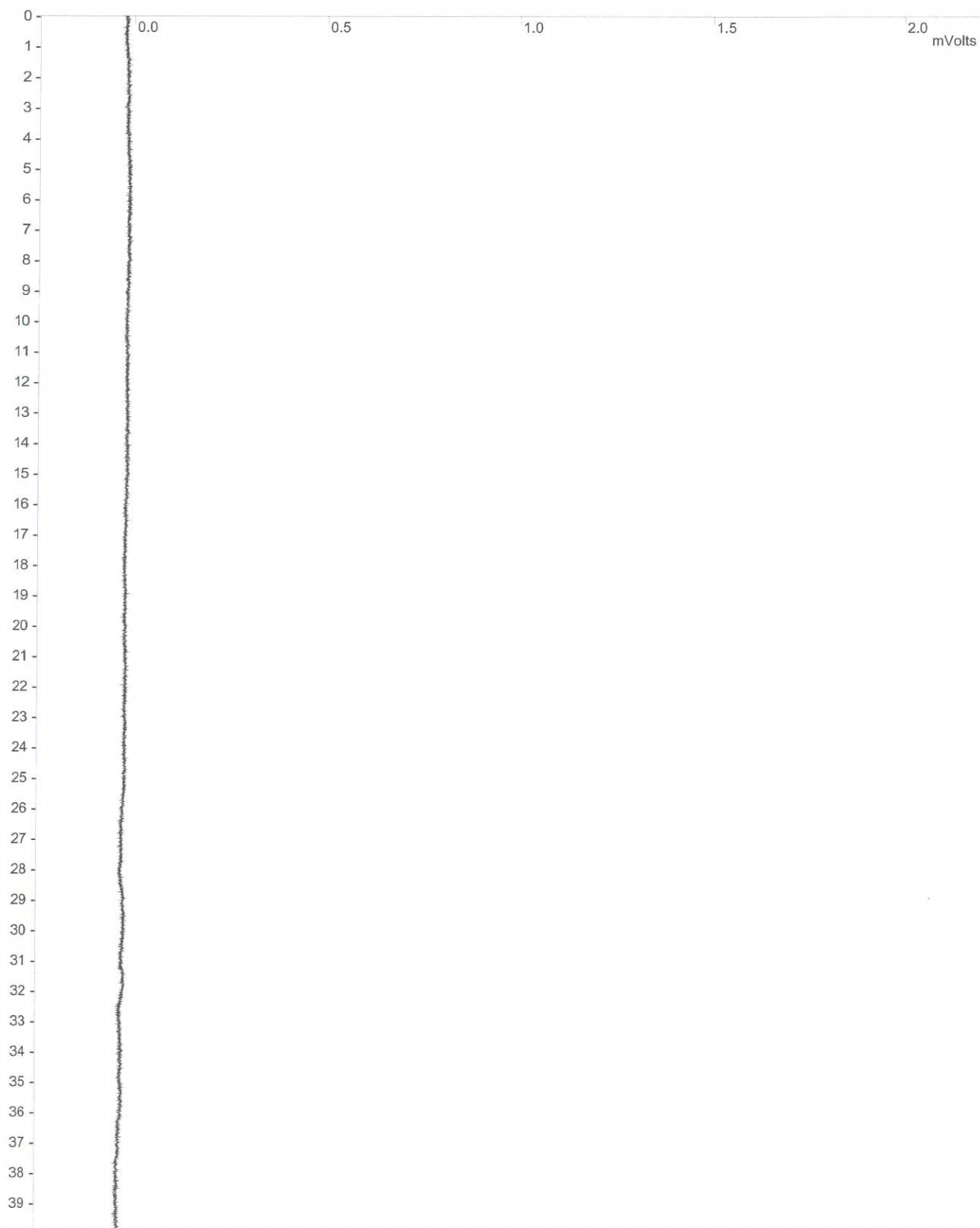
Title :  
Run File : f:\ \sps2024\cal2024\baseline2024002.run  
Method File : D:\Method-GC\star C\Star\TU\cal0203\baseline FID.mth  
Sample ID : Baseline2024

Injection Date: 5/8/2567 14:01      Calculation Date: 5/8/2567 14:41

Operator : watsamon      Detector Type: 3800 (10 Volts)  
Workstation: Local Disk      Bus Address : 44  
Instrument :      Sample Rate : 10.00 Hz  
Channel : Front = FID      Run Time : 39.960 min

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

Chart Speed = 0.56 cm/min      Attenuation = 1      Zero Offset = 10%  
Start Time = 0.000 min      End Time = 39.960 min      Min / Tick = 1.00



Title :  
 Run File : f:\ \sps2024\cal2024\baseline2024002.run  
 Method File : D:\Method-GC\star C\Star\TU\cal0203\baseline FID.mth  
 Sample ID : Baseline2024

Injection Date: 5/8/2567 14:01      Calculation Date: 5/8/2567 14:41

Operator : suwarot      Detector Type: 3800 (10 Volts)  
 Workstation: Local Disk      Bus Address : 44  
 Instrument :      Sample Rate : 10.00 Hz  
 Channel : Front = FID      Run Time : 39.960 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: -16 microVolts                      LSB:      1 microVolts

Noise (used): 22 microVolts - monitored before this run

Manual injection

Data Handling: No peaks

\*\*\*\*\*



Title :  
Run File : f:\sps2024\cal2024\fid2024003.run  
Method File : d:\cafid2024003-front.mth  
Sample ID : FID2024

Injection Date: 5/8/2567 9:16

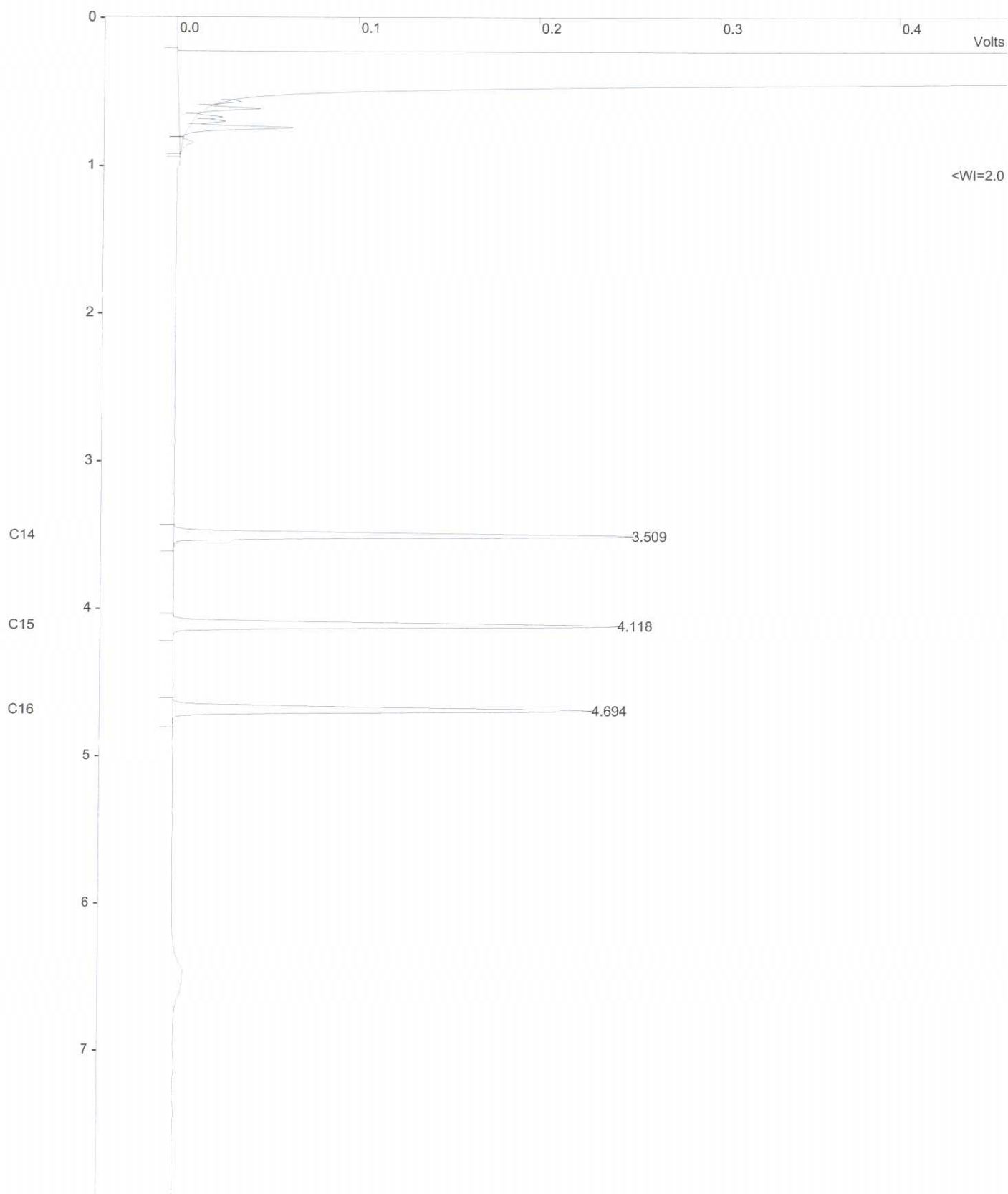
Calculation Date: 5/8/2567 9:26

Operator : suwarot  
Workstation: GC-LAB  
Instrument :  
Channel : Front = FID

Detector Type: 3800 (10 Volts)  
Bus Address : 44  
Sample Rate : 10.00 Hz  
Run Time : 7.993 min

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

Chart Speed = 2.83 cm/min    Attenuation = 205    Zero Offset = 8%  
Start Time = 0.000 min    End Time = 7.993 min    Min / Tick = 1.00



Title :  
Run File : f:\ \sps2024\cal2024\fid2024003.run  
Method File : d:\fid2024003-front.mth  
Sample ID : FID2024

Injection Date: 5/8/2567 9:16 Calculation Date: 5/8/2567 9:26

Operator : suwarot 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 : 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
1	C14	54.1202	3.509	-0.005	163565	BB	2.1	C
2	C15	53.5241	4.118	-0.005	157309	BB	2.2	C
3	C16	52.2361	4.694	0.001	146804	BB	2.3	C
Totals:		159.8804		-0.009	1704289			

Status Codes:  
C - Out of calibration range

Total Unidentified Counts : 69332200 counts

Detected Peaks: 11 Rejected Peaks: 0 Identified Peaks: 3

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: -29 microVolts LSB: 1 microVolts

Noise (used): 28 microVolts - monitored before this run

Manual injection

Calib. out of range; No Recovery Action Specified

\*\*\*\*\*

Sample ID:        **fid std**

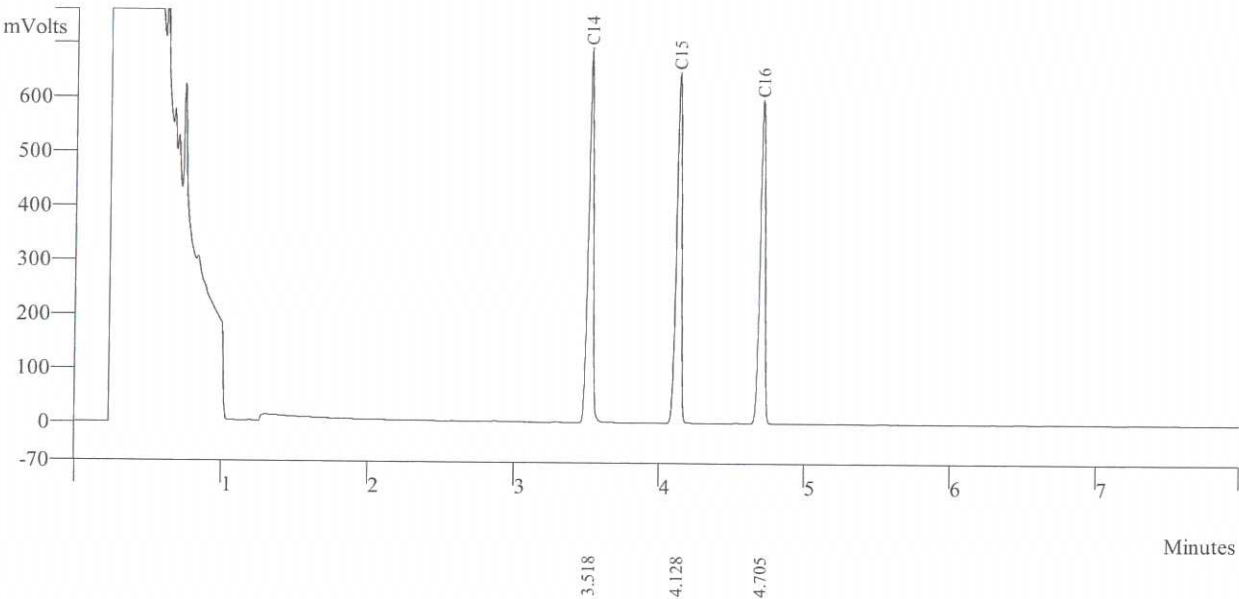
Operator (Inj):    suwarot  
Injection Date:    05/08/2024  
Calc Date:        05/08/2024  
Run Time (min):   7.993  
Workstation:       GC-LAB  
Instrument (Inj):



Run Mode:            Analysis  
Peak Measurement: Peak Area  
Calculation Type:   External Std.

c:\star\data\tu\cal2024\fid2024001.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	152.6865	3.518	163565	BB	2.2
2	C15	147.1889	4.128	157309	BB	2.3
3	C16	138.7997	4.705	146804	BB	2.3
Totals		438.6751		467678		



Sample ID: **fid std**

Operator (Inj): suwarot

Injection Date: 05/08/2024

Calc Date: 05/08/2024

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):



**VARIAN**

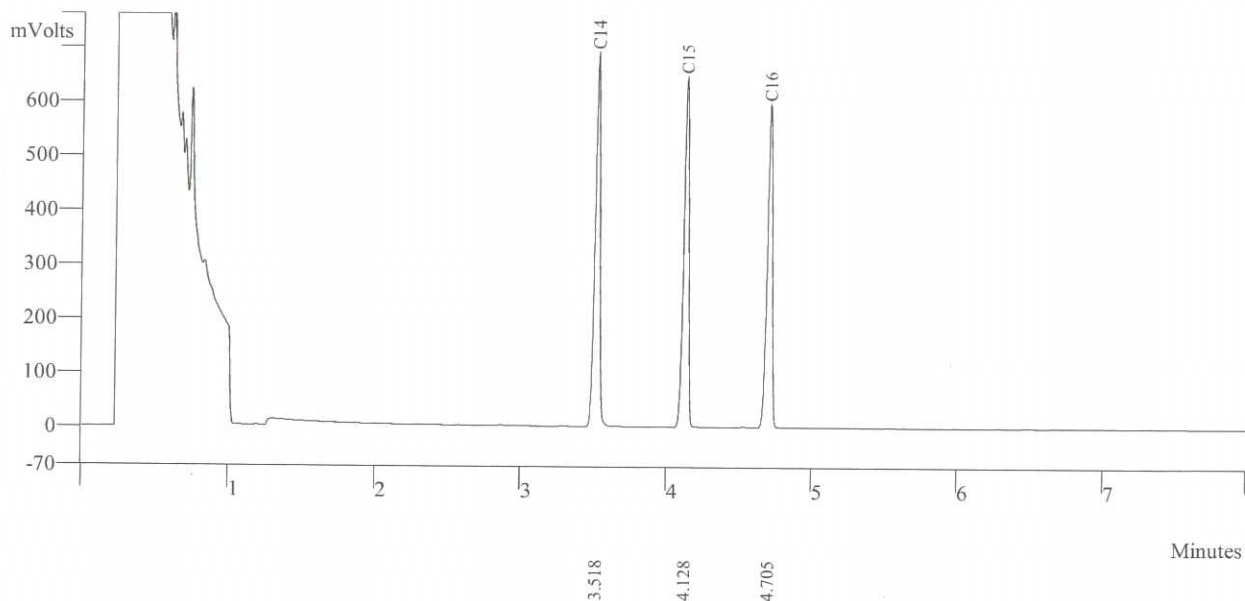
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2024\fid2024002.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	152.6865	3.518	168565	BB	2.2
2	C15	137.1189	4.128	159359	BB	2.3
3	C16	128.7997	4.705	147834	BB	2.3
Totals		418.6042		475758		

Sample ID:       **fid std**

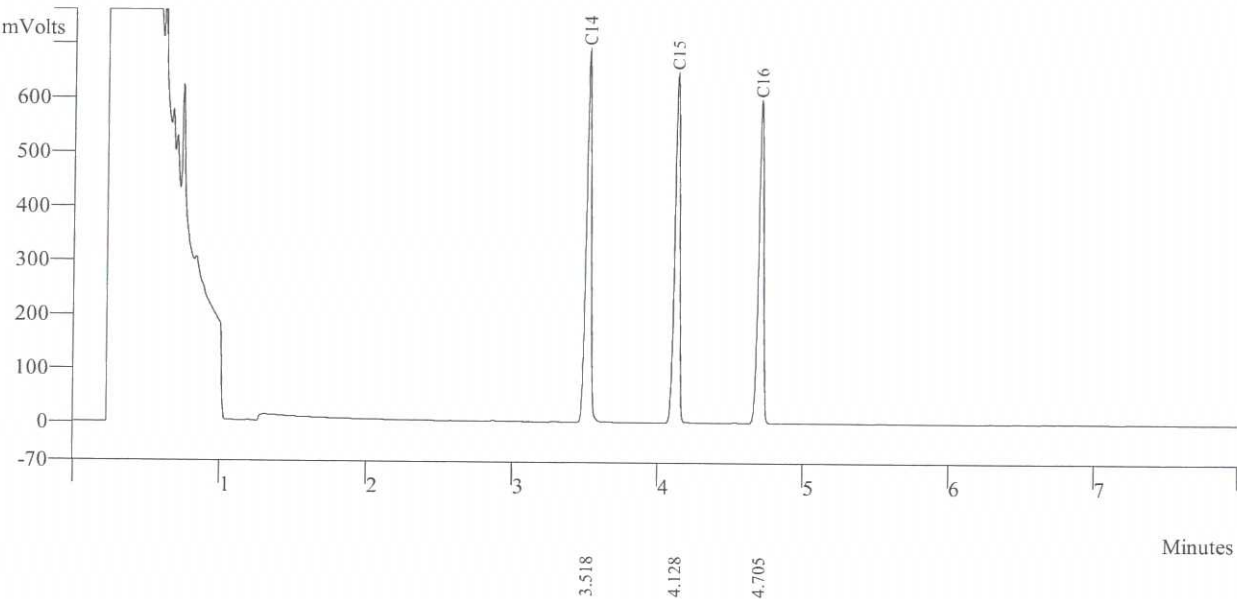
Operator (Inj):     suwarot  
Injection Date:     05/08/2024  
Calc Date:         05/08/2024  
Run Time (min):    7.993  
Workstation:       GC-LAB  
Instrument (Inj):



Run Mode:           Analysis  
Peak Measurement: Peak Area  
Calculation Type:   External Std.

c:\star\data\tu\cal2024\fid2024003.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	152.7865	3.518	169535	BB	2.2
2	C15	197.1159	4.128	157349	BB	2.3
3	C16	128.5997	4.705	149834	BB	2.3
	Totals	478.5021		476718		







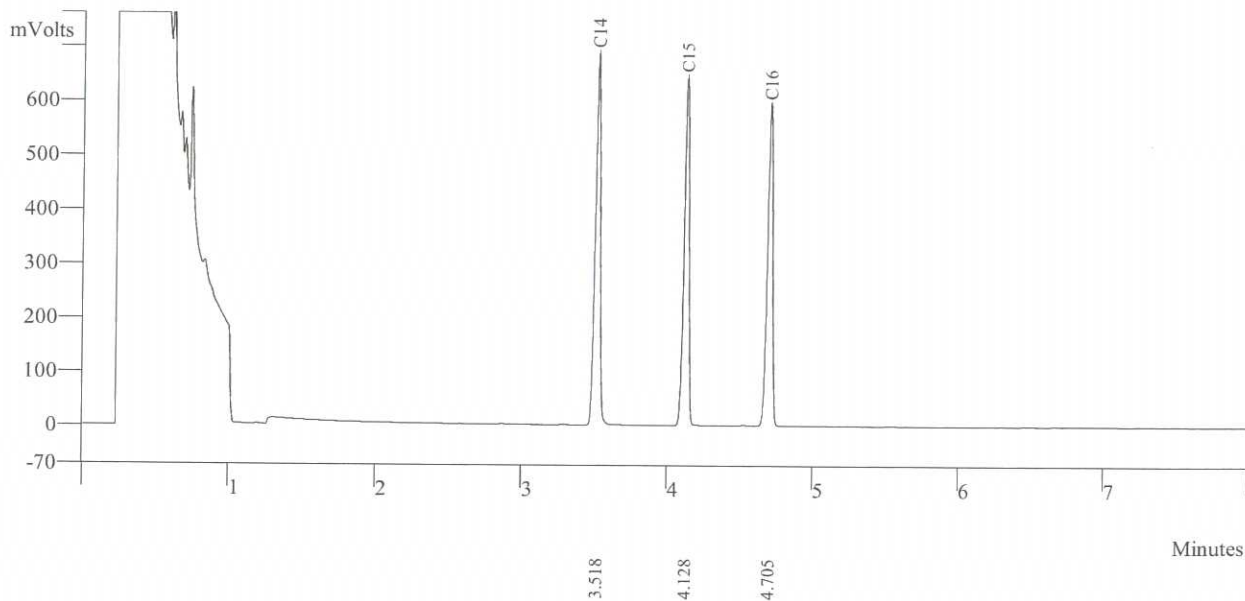
Sample ID: fid std

Operator (Inj): suwarot  
Injection Date: 05/08/2024  
Calc Date: 05/08/2024  
Run Time (min): 7.993  
Workstation: GC-LAB  
Instrument (Inj):

  
**VARIAN**

Run Mode: Analysis  
Peak Measurement: Peak Area  
Calculation Type: External Std.

c:\star\data\tu\cal2024\fid2024005.runA = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	162.7965	3.518	164521	BB	2.2
2	C15	137.1159	4.128	158379	BB	2.3
3	C16	128.1947	4.705	149834	BB	2.3
Totals		428.1071		472734		





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

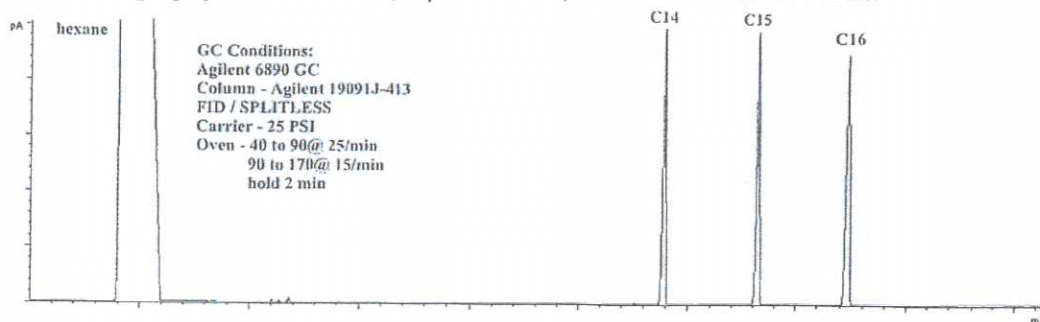
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

#### 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  
QMS Representative



## Certificate of Calibration

Certificate No.: WK2312-031-1

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 : 6-Dec-23  
Calibrated Date : 7-Dec-23  
Issued Date : 12-Dec-23  
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	WK2305-049-5	22-May-24	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.Taywanat Hansuwankul

Approved by :

Ms. Budsagorn Patcha  
Authorized Signatory



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## Calibration Results

Certificate No. : WK2312-031-1

Page 2 of 2

### Calibration Result of the Accuracy

Function : Flow Measurement

Range : 0 ml/min to 750 ml/min

Resolution : 0.01 / 0.1 / 1 ml/min

Unit : ml/min

UUC Setting		STD Reading	Error	Uncertainty ( $\pm$ )	Tolerance Limit Values (ml/min)
Scale	ml/min				
0	0.00	0.00	0.00	3.3	-0.20 ~ 0.20
50	50.7	51.15	-0.45	3.3	48.80 ~ 51.20
300	300	300.4	-0.4	3.3	293.8 ~ 306.2
450	450	450.7	-0.7	3.3	440.8 ~ 459.2
550	550	549.5	0.5	3.3	533.5 ~ 566.5
650	650	649.3	0.7	3.3	630.5 ~ 669.5
700	700	699.2	0.8	3.3	679.0 ~ 721.0

(X) Without Adjustment ( ) After Adjustment

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\*\*\*\* End of Certificate\*\*\*\*





**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 : LF24-0278  
Equipment : Thermometer  
Manufacturer : Fluke  
Model : 51  
Serial Number : 5910857  
Asset Number : 5910857  
Customer : Thai Unique Co., Ltd.  
80-82 Prachathipatai Road,  
Bangkhunphrom, Pranakorn,  
Bangkok 10200  
Date of Calibrate : 26-Jun-2024  
Date of Issue : 27-Jun-2024

*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

*Nanthiya Ngampring*

Mrs. Nanthiya Ngampring  
Metrology Technician

Approved by

*A B.*

Mrs. Arunee Bamrungtham  
Cal-Lab Manager



Measuretronix Limited

## Calibration Report

### UUC : Fluke 51 Thermometer

Serial No. : 5910857

Asset No. : 5910857

Procedure : CP-LF-04:Rev.02

Note : Refer to Fluke 51,52 Operator's Manual Rev 1 3/86, Oct 1985

Customer : Thai Unique Co., Ltd.

Address : 80-82 Prachathipatai Road,  
Bangkhunphrom, Pranakorn,  
Bangkok 10200

Certificate No. : LF24-0278

Report data type : As-Found

Date of Calibrate : 26-Jun-2024

Date of Receive : 17-Jun-2024

### Environment condition

Temperature : 23 °C ± 3 °C

Humidity : 50 %RH ± 20 %RH

*Measuretronix Cal-Lab certifies that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). The measurements are traceable to national or international measurement standards or accept fundamental or natural physical constants or have been derived by approved ratio techniques as state in the Standard Used below. The policies and procedures used comply with ISO/IEC 17025:2017.*

*This report applies only to the item identified and shall not be reproduced other than in full, without specific written approved by Measuretronix Cal-Lab.*

*The uncertainties shown are the expanded uncertainties, which calculated from the standard uncertainties multiplied by a coverage factor of  $k = 2$ , providing a measurement confidence level of approximately 95%.*

*No statement of compliance with specifications is made or implied on this certificate.*

Remark : The units of uncertainty values in this report are referred to the below details :

"Volt" or "V" for voltage, "Ampere" or "A" for current, "Ohm" or "Ω" for resistance, "Farad" or "F" for capacitance, "Hertz" or "Hz" for frequency, "deg C" or "°C" for degree Celsius, "deg F" or "°F" for degree Fahrenheit, etc.

### Standard Used

Serial/Asset	Description	Traceable	Cert.No.	Cal.Date	Due Date
6400011	Fluke 5500A Calibrator	NIMT	EE-0017-24	7-Mar-2024	6-Mar-2025

## Test Data

TEST	RANGE	Nominal Value	UUC Tol. (+/-)	Test Result	Error	Uncertainty (+/-)
THERMOCOUPLE MEASUREMENT CALIBRATION						
TYPE K THERMOCOUPLE						
1		-195.0 °C*	0.9 °C	-195.4 °C	-0.4 °C	0.27 °C
2		-100.0 °C	0.8 °C	-100.5 °C	-0.5 °C	0.21 °C
3		-50.0 °C	0.8 °C	-50.2 °C	-0.2 °C	0.21 °C
4		0.0 °C	0.7 °C	0.0 °C	0.0 °C	0.21 °C
5		100.0 °C	0.8 °C	100.1 °C	0.1 °C	0.21 °C
6		300.0 °C	1.0 °C	300.2 °C	0.2 °C	0.21 °C
7		500.0 °C	1.2 °C	500.1 °C	0.1 °C	0.21 °C
8		1365.0 °C	2.1 °C	1365.2 °C	0.2 °C	0.32 °C
TYPE J THERMOCOUPLE						
9		-195.0 °C*	1.0 °C	-194.4 °C	0.6 °C	0.22 °C
10		-100.0 °C	0.9 °C	-99.3 °C	0.7 °C	0.18 °C
11		-50.0 °C	0.9 °C	-49.4 °C	0.6 °C	0.18 °C
12		0.0 °C	0.8 °C	0.5 °C	0.5 °C	0.18 °C
13		100.0 °C	0.9 °C	100.4 °C	0.4 °C	0.18 °C
14		300.0 °C	1.1 °C	300.8 °C	0.8 °C	0.18 °C
15		755.0 °C	1.6 °C	755.3 °C	0.3 °C	0.18 °C

**End of Calibration Report**



# *Certificate*

It is hereby certified that

**Suwarot Trikainut**

Has successfully completed the Application Training for

**Basic Gas Chromatography and Sampler**

Training Contents were:

**Hardware Operation, Software Operation, Data analysis and**

**Troubleshooting : Model**

**CP-3800, 3900, 450-GC, 430-GC, 456-GC, 436-GC**

At Thai Unique Co., Ltd, Bangkok, Thailand

On 15<sup>th</sup> March, 2019



S. Pohtongkam

Service Manager

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

CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	05 May 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R03	SERIAL NO.	4410		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 28 October 2024			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV
Certified Date	: 05 January 2023	Expired Date	: 05 January 2026	Cylinder Conc.	: 48.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO <sub>x</sub> Span	400	399.9	-0.025	400.0	1.008
API Model 200E NO <sub>x</sub> 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	103.4	mV	-20 - 150		
AZERO	94.0	mV	-20 - 150		
HVPS	675	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.0	°C	8 - 48		
PMT TEMP	7.5	°C	7 ± 2		
MOLY TEMP	314.8	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.1	mV	-20 to +150		
NO <sub>x</sub> Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)







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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					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	05 May 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R07	SERIAL NO.	4468		
Calibrator (Dilution System)					
Brand : Teledyne			Model : 700E		
Last Cal. Date : 28 October 2024			Serial No. : 201-5		
Reference Standard Gas					
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00726SV		
Certified Date : 05 January 2023		Expired Date : 05 January 2026		Cylinder Conc. : 48.8 ppm	
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
% RH 50					
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	400.1	0.025	400.0	1.009
NO <sub>x</sub> Span	400	400.3	0.075	400.0	1.013
API Model 200E NO <sub>x</sub> 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	513	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.5	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	672	V	420 - 900 constant		
RCELL TEMP	50.1	°C	50 ± 1		
BOX TEMP	29.4	°C	8 - 48		
PMT TEMP	7.2	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.6	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.009	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.013	-	1.0 ± 0.3		
NO Offset	1.6	mV	-20 to +150		
NO <sub>x</sub> Offset	1.1	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

  
(Mr.Kaseam Simaphon)

Approved by :

  
(Mr.Yuthana Thanataranit)



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

CALIBRATION REPORT						
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER						
DATE :	05 May 2025	BRAND :	API	MODEL :	200E	
NO.	NOX-R08	SERIAL NO.	243			
Calibrator (Dilution System)						
Brand : Teledyne			Model : 700E			
Last Cal. Date : 28 October 2024			Serial No. : 201-S			
Reference Standard Gas						
Standard Gas : Nitric Oxide (NO)			Cylinder No. : A00726SV			
Certified Date : 05 January 2023		Expired Date : 05 January 2026		Cylinder Conc. : 48.8 ppm		
CALIBRATING CONDITION						
Pressure	1011	mmbar	Temp.	24.6	°C	
% RH						50
CALIBRATION SETTING						
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB		
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope	
Zero	0	-0.10	-	0	-	
NO Span	400	399.9	-0.025	400.0	1.008	
NO <sub>x</sub> Span	400	400.1	0.025	400.0	1.011	
API Model 200E NO <sub>x</sub> Analyzer Check List						
Test Values	Observed Value	Units	Nominal Range			
RANGE	500	PPB	500 standard			
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air			
SAMPLE FLOW	506	cc/min	500 ± 50			
OZONE FLOW	78	cc/min	80 ± 15			
PMT	103.3	mV	-20 - 150			
AZERO	94.1	mV	-20 - 150			
HVPS	673	V	420 - 900 constant			
RCELL TEMP	50.0	°C	50 ± 1			
BOX TEMP	28.9	°C	8 - 48			
PMT TEMP	7.3	°C	7 ± 2			
MOLY TEMP	314.9	°C	315 ± 5			
RCELL PRESS	8.2	IN-Hg-A	2 - 10 constant			
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant			
NO Span Conc	400	PPB	20 - 20,000			
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000			
NO Slope	1.008	-	1.0 ± 0.3			
NO <sub>x</sub> Slope	1.011	-	1.0 ± 0.3			
NO Offset	1.3	mV	-20 to +150			
NO <sub>x</sub> Offset	0.8	mV	-20 to 150			
Stability at Zero	0.1	PPB	< 0.2			
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas			

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)





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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					
CHEMILUMINESCENT NO / NO <sub>2</sub> / NO <sub>x</sub> ANALYZER					
DATE :	05 May 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R09			SERIAL NO.	252
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 28 October 2024			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV
Certified Date	: 05 January 2023		Expired Date	: 05 January 2026	
				Cylinder Conc.	: 48.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.6	°C
			% RH	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
NO Span	400	399.6	-0.100	400.0	1.005
NO <sub>x</sub> Span	400	399.8	-0.050	400.0	1.008
API Model 200E NO <sub>x</sub> 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	503	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.1	mV	-20 - 150		
AZERO	93.9	mV	-20 - 150		
HVPS	675	V	420 - 900 constant		
RCELL TEMP	50.5	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.4	°C	7 ± 2		
MOLY TEMP	315.1	°C	315 ± 5		
RCELL PRESS	8.5	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.7	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO <sub>x</sub> Span Conc	400	PPB	20 - 20,000		
NO Slope	1.005	-	1.0 ± 0.3		
NO <sub>x</sub> Slope	1.008	-	1.0 ± 0.3		
NO Offset	1.0	mV	-20 to +150		
NO <sub>x</sub> Offset	0.6	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT  
SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 05 May 2025

BRAND : TELEDYNE

MODEL : 100E

NO. SO<sub>2</sub>-R01

SERIAL NO. 3415

Calibrator (Dilution System)

Brand : Teledyne

Model : 700E

Last Cal. Date : 28 October 2024

Serial No. : 201-S

Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>)

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 50

CALIBRATION SETTING

Span	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	% Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.6	-0.100	400.0	1.006

API Model TML-60 SO<sub>2</sub> 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	657	cc/min	650 ± 10%
PMT	103.2	mV	-20-150 with Zero Air
UV LAMP	3036.3	mV	1000-4900
STR. LGT	61.8	PPB	<100
DRK PMT	63.4	mV	-50 - 200
DRK LMP	58.0	mV	-50 - 200
HVPS	673	V	550-900 constant
DCPS	2529	mV	2500 ± 200
RCELL TEMP	50.3	°C	50 ± 1
BOX TEMP	29.1	°C	5-40
PMT TEMP	7.5	°C	7 ± 2.0
SO <sub>2</sub> Span Conc	400	PPB	20-20,000
SO <sub>2</sub> Slope	1.006	-	1.0 ± 0.3
SO <sub>2</sub> 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 :

*W. K. Simaphon*

(Mr.Kaseam Simaphon)

Approved by :

*Yuthana S.*

(Mr.Yuthana Thanataranit)





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### CALIBRATION REPORT

#### SO<sub>2</sub> FLUORESCENT ANALYZER

DATE : 05 May 2025

BRAND : TELEDYNE

MODEL : 100E

NO. SO<sub>2</sub>-R02

SERIAL NO. 3431

#### Calibrator (Dilution System)

Brand : Teledyne

Model : 700E

Last Cal. Date : 28 October 2024

Serial No. : 201-S

#### Reference Standard Gas

Standard Gas : Sulphur Dioxide (SO<sub>2</sub>)

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 50

#### CALIBRATION SETTING

Span Set Point	Initial Reading (Before Adj.), PPB			Final Reading (After Adj.), PPB	
	Expected Concentration	Analyzer Response	% Dif	Analyzer Response	Slope
Zero	0	0.11	-	0	-
SO <sub>2</sub> Span	400.0	400.1	0.025	400.0	1.012

#### API Model TML-60 SO<sub>2</sub> Analyzer Check list

Test Values	Observed Value	Units	Nominal Range
RANGE	500	PPB	0-500
SAMPLE PRESS	28.7	in-Hg	25-35
SAMPLE FLOW	653	cc/min	650 ± 10%
PMT	103.0	mV	-20-150 with Zero Air
UV LAMP	3021.8	mV	1000-4900
STR. LGT	61.5	PPB	<100
DRK PMT	62.9	mV	-50 - 200
DRK LMP	57.6	mV	-50 - 200
HVPS	669	V	550-900 constant
DCPS	2520	mV	2500 ± 200
RCELL TEMP	50.4	°C	50 ± 1
BOX TEMP	29.3	°C	5-40
PMT TEMP	7.2	°C	7 ± 2.0
SO <sub>2</sub> Span Conc	400	PPB	20-20,000
SO <sub>2</sub> Slope	1.012	-	1.0 ± 0.3
SO <sub>2</sub> 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 :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	05 May 2025	BRAND :	API	MODEL :	100E
NO.	SO <sub>2</sub> -R05			SERIAL NO.	3490
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 28 October 2024			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			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	50	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.8	-0.050	400.0	1.007
API Model 100E SO <sub>2</sub> 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	660	cc/min	650 ± 10%		
PMT	103.2	mV	-20-150 with Zero Air		
UV LAMP	3038.6	mV	1000-4900		
STR. LGT	61.5	PPB	<100		
DRK PMT	63.0	mV	-50 - 200		
DRK LMP	57.7	mV	-50 - 200		
HVPS	671	V	550-900 constant		
DCPS	2526	mV	2500 ± 200		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	29.3	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.007	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.6	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 :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)





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CALIBRATION REPORT					
SO <sub>2</sub> FLUORESCENT ANALYZER					
DATE :	05 May 2025	BRAND :	API	MODEL :	100E
NO.	SO <sub>2</sub> -R06	SERIAL NO.	066		
Calibrator (Dilution System)					
Brand	: Teledyne			Model	: 700E
Last Cal. Date	: 28 October 2024			Serial No.	: 201-S
Reference Standard Gas					
Standard Gas	: Sulphur Dioxide (SO <sub>2</sub> )			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	50				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	0.10	-	0	-
SO <sub>2</sub> Span	400.0	399.7	-0.075	400.0	1.008
API Model 100E SO <sub>2</sub> Analyzer Check list					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	0-500		
SAMPLE PRESS	28.4	in-Hg	25-35		
SAMPLE FLOW	654	cc/min	650 ± 10%		
PMT	103.5	mV	-20-150 with Zero Air		
UV LAMP	3054.2	mV	1000-4900		
STR. LGT	61.9	PPB	<100		
DRK PMT	63.5	mV	-50 - 200		
DRK LMP	58.1	mV	-50 - 200		
HVPS	670	V	550-900 constant		
DCPS	2517	mV	2500 ± 200		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.0	°C	5-40		
PMT TEMP	7.1	°C	7 ± 2.0		
SO <sub>2</sub> Span Conc	400	PPB	20-20,000		
SO <sub>2</sub> Slope	1.008	-	1.0 ± 0.3		
SO <sub>2</sub> Offset	21.6	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 :

*Mr. Kaseam Simaphon*

(Mr.Kaseam Simaphon)

Approved by :

*Mr. Yuthana Thanataranit*

(Mr.Yuthana Thanataranit)

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำเสีย



## CERTIFICATE OF CALIBRATION FOR

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

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

DATE OF RECEIVED : 17 June 2025

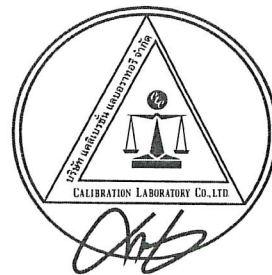
DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seehanart  
Wenick Inchaisri  
Calibration Engineer



Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
20 June 2025



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

Certificate No. Q25070523

F3-011-05/12-23

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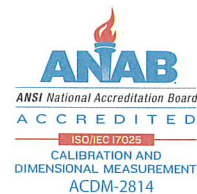


**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

2/10-11,14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## REPORT OF CALIBRATION

### FOR

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

---

#### ENVIRONMENT CONDITIONS :

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

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

#### PROCEDURE USED :

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

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

#### REFERENCE STANDARD USED :

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

Certificate No. **Q25070523**

**F3-011-05/12-23**

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## TRACEABILITY :

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

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25070523

F3-011-05/12-23

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**CLC**  
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ISO/IEC 17025

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**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

## CALIBRATION DATA

### 1. pH METER RESULT @ 25 °C

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

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

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

### 2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe  $\varnothing$  3 mm

Materials : Metal Sheath.

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

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

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

**### End of Certificate ###**

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration



## Certificate of Calibration

**Certificate No. :** 68-400046-2

**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 :** 21 January 2025

**Date of Calibration :** 24 January 2025

**Date of Issue :** 24 January 2025

**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	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)
400004	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)

Approved by :



( Permpoon 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. :** 68-400046-2

**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 0.4429 °C

Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
20.4801	20	0.5	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%

- ๐0๐ -







CERTIFICATE No : 25M2256

REFERENCE No : 76365-3

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : SARTORIUS

**MODEL** : BSA224S-CW

**SERIAL No** : 36591843

**ID No** : BA09/61

**CONDITION AS RECEIVED** : USED ITEM

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

**CALIBRATED BY** : ATSAWIN Y.

**CALIBRATION DATE** : 07-Mar-25

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 13-Mar-25

**RECEIVED DATE** : 07-Mar-25

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







CERTIFICATE No : 25M2256

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW  
MANUFACTURER : SARTORIUS S/N : 36591843  
ID No : BA09/61 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24° C  $\pm$  1° C RELATIVE HUMIDITY : 52 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

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

### 2. REFERENCE STANDARD INSTRUMENTS :-

<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

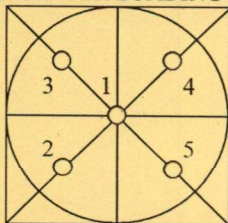
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.0000	0.0000	0.00012
0.10	0.1000	0.0000	0.00012
0.20	0.2000	0.0000	0.00012
0.50	0.5000	0.0000	0.00012
1.00	1.0000	0.0000	0.00012
2.00	2.0000	0.0000	0.00012
5.00	5.0000	0.0000	0.00012
10.00	10.0000	0.0000	0.00012
20.00	20.0001	-0.0001	0.00012
50.00	50.0000	0.0000	0.00014
100.00	100.0001	-0.0001	0.00019
200.00	200.0001	-0.0001	0.00032

### 5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT





CERT.No.: HS-W015C

Calibration Date : 18 Mar 25  
 Submitted by : S.P.S CONSULTING SERVICE CO.,LTD  
 7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,  
 Chatuchak, Bangkok, Thailand 10900

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

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

#### Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.07	(PASS)	-
Measurement 5 (mg/l)	9.07	(PASS)	-
Measurement 6 (mg/l)	9.07	(PASS)	-
Measurement 7 (mg/l)	9.07	(PASS)	-
Measurement 8 (mg/l)	9.07	(PASS)	-
Measurement 9 (mg/l)	9.07	(PASS)	-
Measurement 10 (mg/l)	9.07	(PASS)	-

Mean Measurement	9.07	mg/l	-	-
Inaccuracy	0.02	mg/l	-	-

Overall Status (PASS)

#### Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



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 : 25T0520

REFERENCE No : 75853-1

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : COD REACTOR

**MANUFACTURER** : HACH

**MODEL** : DRB 200

**SERIAL No** : 15110C0497

**ID No** : DRB 05/59

**CONDITION AS RECEIVED** : USED ITEM

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

**CALIBRATED BY** : CHAICHARN CH.

**CALIBRATION DATE** : 27-Jan-25

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 27-Jan-25

**RECEIVED DATE** : 15-Jan-25

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



F-G010 REV : 03





# QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 25T0520

PAGE : 2 OF 2

## Calibration Report

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

### CONDITION OF THIS RESULTS OF CALIBRATION

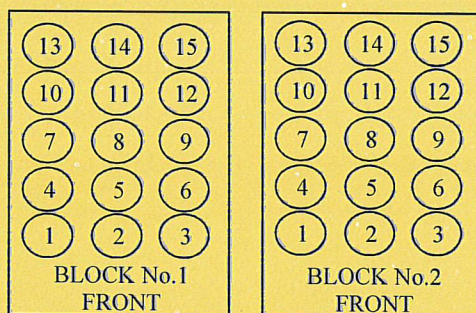
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	6635300	24T6468	26-Jun-25

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

**RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT**



Block No.		1	2
Calibration Point (°C)		150	150
Controller temperature (°C)		144	144
Indicating Temperature		144	144
Measured Temperature (° C) at Spread Locations	1	150.01	149.57
	2	150.69	150.44
	3	150.40	149.46
	4	150.22	149.89
	5	150.27	149.75
	6	150.51	150.45
	7	150.24	150.03
	8	150.20	150.08
	9	150.14	150.14
	10	149.70	149.83
	11	149.58	149.89
	12	149.46	149.79
	13	148.77	149.03
	14	148.99	149.14
	15	149.02	149.62
Uncertainty of Measurement(± °C)		0.87	0.87

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

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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


END OF CALIBRATION REPORT





## ***GC Clarus 600/680 Preventive Maintenance (PM)***

<b>Company Name:</b>	<b>S.P.S. Consulting Service Co.,Ltd</b>		
<b>Address (Instrument Location):</b>	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
<b>Serial Number:</b>	680S14042502	<b>Service Tag:</b>	N68APSSFxMP
<b>Customer Name (if applicable):</b>	Ms.Naruecha	<b>PM number:</b>	1 of 2
<b>Service Engineer Name:</b>	Monchai Kitcharoenkeat	<b>Service Order Number:</b>	WO-
<b>Date PM Performed: (DD-MMM-YYYY)</b>	22-Feb-2025	<b>Next PM Due Date: (DD-MMM-YYYY)</b>	22-Aug-2025

<b>Part Number</b>	<b>Release</b>	<b>Publication Date</b>	
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 0.33 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>1.12</u>	mV.
Detector Channel B	<u>NA</u>	mV.

### 3. Diagnostics Tests:

- ☒ Run instrument diagnostics.
 

<input checked="" type="checkbox"/> BRAM	Pass
<input checked="" type="checkbox"/> EPROM	Pass
- ☒ Run Autosampler diagnostics.
 

<input checked="" type="checkbox"/> BRAM	Pass
<input checked="" type="checkbox"/> 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

<p><i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i></p>		
<p><i>This Clarus600/680 GC      Pass      the preventive maintenance.</i></p>		
<p><b>Review of Preventive Maintenance:</b></p>		
<p>Authorized PerkinElmer Representative:</p> <p>Monchai Kitcharoenkeat</p>	<p><i>Monchai</i></p>	<p>Date:</p> <p>22-Feb-2025 (DD-MMM-YYYY)</p>
<p>Authorized Customer Representative:</p> <p>Ms.Naruecha</p>	<p><i>Naruecha</i></p>	<p>Date:</p> <p>22-Feb-2025 (DD-MMM-YYYY)</p>

เอกสารสอบเทียบเครื่องมือการตรวจวิเคราะห์คุณภาพน้ำผิวดิน

## CERTIFICATE OF CALIBRATION FOR

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

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

DATE OF RECEIVED : 17 June 2025

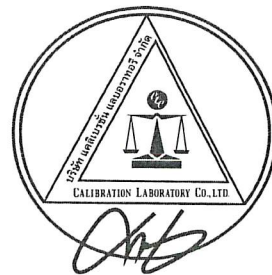
DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seehanart  
Wenick Inchaisri  
Calibration Engineer



Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
20 June 2025



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

Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4







**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

2/10-11,14, 55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## REPORT OF CALIBRATION

### FOR

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

---

#### ENVIRONMENT CONDITIONS :

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

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

#### PROCEDURE USED :

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

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

#### REFERENCE STANDARD USED :

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

Certificate No. **Q25070523**

**F3-011-05/12-23**

page 2 of 4



@clccalibration



# CALIBRATION LABORATORY Co., LTD.

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



## TRACEABILITY :

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

## UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q25070523

F3-011-05/12-23

page 3 of 4



@clccalibration



**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



**CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

## CALIBRATION DATA

### 1. pH METER RESULT @ 25 °C

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

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

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

### 2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe  $\varnothing$  3 mm

Materials : Metal Sheath.

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

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

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

**### End of Certificate ###**

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration



## Certificate of Calibration

**Certificate No. :** 68-400046-2

**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 :** 21 January 2025

**Date of Calibration :** 24 January 2025

**Date of Issue :** 24 January 2025

**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	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)
400004	23E1866	01 Jun 2025	National Institute of Metrology Thailand (NIMT)

Approved by :



( Permpoon 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. : 68-400046-2**

**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 0.4429 °C

Standard Reading ( °C )	UUC Reading ( °C )	Correction ( °C )	Uncertainty ( ± °C )
20.4801	20	0.5	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%

- ๐0๐ -







CERTIFICATE No : 25M2256

REFERENCE No : 76365-3

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : DIGITAL BALANCE

**MANUFACTURER** : SARTORIUS

**MODEL** : BSA224S-CW

**SERIAL No** : 36591843

**ID No** : BA09/61

**CONDITION AS RECEIVED** : USED ITEM

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

**CALIBRATED BY** : ATSAWIN Y.

**CALIBRATION DATE** : 07-Mar-25

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 13-Mar-25

**RECEIVED DATE** : 07-Mar-25

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







CERTIFICATE No : 25M2256

PAGE : 2 OF 2

## Calibration Report

EQUIPMENT : DIGITAL BALANCE MODEL : BSA224S-CW  
MANUFACTURER : SARTORIUS S/N : 36591843  
ID No : BA09/61 RECEIVED DATE : 07-Mar-25  
AIR PRESSURE : 1009mbar  $\pm$  1mbar CALIBRATION DATE : 07-Mar-25  
AMBIENT TEMPERATURE : 24° C  $\pm$  1° C RELATIVE HUMIDITY : 52 %RH  $\pm$  10 % RH

### CONDITION OF THIS RESULTS OF CALIBRATION

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

### 2. REFERENCE STANDARD INSTRUMENTS :-

<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

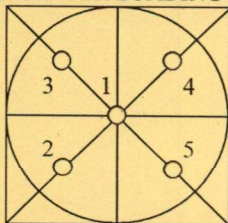
2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 200 g WAS 0.000071 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY ( $\pm$ g)
0.00	0.0000	0.0000	0.00012
0.10	0.1000	0.0000	0.00012
0.20	0.2000	0.0000	0.00012
0.50	0.5000	0.0000	0.00012
1.00	1.0000	0.0000	0.00012
2.00	2.0000	0.0000	0.00012
5.00	5.0000	0.0000	0.00012
10.00	10.0000	0.0000	0.00012
20.00	20.0001	-0.0001	0.00012
50.00	50.0000	0.0000	0.00014
100.00	100.0001	-0.0001	0.00019
200.00	200.0001	-0.0001	0.00032

### 5. OFF CENTER LOADING ERROR



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

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

END OF CALIBRATION REPORT





CERT.No.: HS-W015C

Calibration Date : 18 Mar 25  
Submitted by : S.P.S CONSULTING SERVICE CO.,LTD  
7 Soi Phaholyothin 24, Phaholyothin Rd., Jompol,  
Chatuchak, Bangkok, Thailand 10900

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

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

#### Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.08	(PASS)	-
Measurement 4 (mg/l)	9.07	(PASS)	-
Measurement 5 (mg/l)	9.07	(PASS)	-
Measurement 6 (mg/l)	9.07	(PASS)	-
Measurement 7 (mg/l)	9.07	(PASS)	-
Measurement 8 (mg/l)	9.07	(PASS)	-
Measurement 9 (mg/l)	9.07	(PASS)	-
Measurement 10 (mg/l)	9.07	(PASS)	-

Mean Measurement	9.07	mg/l	-	-
Inaccuracy	0.02	mg/l	-	-

Overall Status (PASS)

#### Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



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 : 25T0520

REFERENCE No : 75853-1

PAGE : 1 OF 2

## Certificate of Calibration

**EQUIPMENT** : COD REACTOR

**MANUFACTURER** : HACH

**MODEL** : DRB 200

**SERIAL No** : 15110C0497

**ID No** : DRB 05/59

**CONDITION AS RECEIVED** : USED ITEM

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

**CALIBRATED BY** : CHAICHARN CH.

**CALIBRATION DATE** : 27-Jan-25

**APPROVED BY** :   
PONGSAK J.

**ISSUED DATE** : 27-Jan-25

**RECEIVED DATE** : 15-Jan-25

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



F-G010 REV : 03





# QUALITY CALIBRATION CO., LTD.

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

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

CERTIFICATE No : 25T0520

PAGE : 2 OF 2

## Calibration Report

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

### CONDITION OF THIS RESULTS OF CALIBRATION

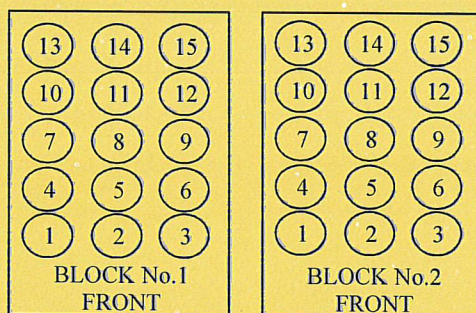
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE.

2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No	CERTIFICATE No	DUE DATE
1) DATA LOGGER WITH TC TYPE K	HYDRA 2635A	6635300	24T6468	26-Jun-25

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

**RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT**



Block No.		1	2
Calibration Point (°C)		150	150
Controller temperature (°C)		144	144
Indicating Temperature		144	144
Measured Temperature (° C) at Spread Locations	1	150.01	149.57
	2	150.69	150.44
	3	150.40	149.46
	4	150.22	149.89
	5	150.27	149.75
	6	150.51	150.45
	7	150.24	150.03
	8	150.20	150.08
	9	150.14	150.14
	10	149.70	149.83
	11	149.58	149.89
	12	149.46	149.79
	13	148.77	149.03
	14	148.99	149.14
	15	149.02	149.62
Uncertainty of Measurement(± °C)		0.87	0.87

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

NOTE 2 : LOCATION 10 WAS REFERENCE LOCATION.

NOTE 3 : THIS CALIBRATION WAS CARRIED OUT AT THE CUSTOMER'S PLACE AT LABORATORY AREA.

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


END OF CALIBRATION REPORT





## ***GC Clarus 600/680 Preventive Maintenance (PM)***

<b>Company Name:</b>	<b>S.P.S. Consulting Service Co.,Ltd</b>		
<b>Address (Instrument Location):</b>	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
<b>Serial Number:</b>	680S14042502	<b>Service Tag:</b>	N68APSSFEMP
<b>Customer Name (if applicable):</b>	Ms.Naruecha	<b>PM number:</b>	1 of 2
<b>Service Engineer Name:</b>	Monchai Kitcharoenkeat	<b>Service Order Number:</b>	WO-
<b>Date PM Performed: (DD-MMM-YYYY)</b>	22-Feb-2025	<b>Next PM Due Date: (DD-MMM-YYYY)</b>	22-Aug-2025

<b>Part Number</b>	<b>Release</b>	<b>Publication Date</b>	
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 0.33 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>1.12</u>	mV.
Detector Channel B	<u>NA</u>	mV.

### 3. Diagnostics Tests:

- ☒ Run instrument diagnostics.
 

<input checked="" type="checkbox"/> BRAM	Pass
<input checked="" type="checkbox"/> EPROM	Pass
- ☒ Run Autosampler diagnostics.
 

<input checked="" type="checkbox"/> BRAM	Pass
<input checked="" type="checkbox"/> 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>		
<b>Review of Preventive Maintenance:</b>		
Authorized PerkinElmer Representative: Monchai Kitcharoenkeat		Date: 22-Feb-2025 <small>(DD-MMM-YYYY)</small>
Authorized Customer Representative: Ms.Naruecha		Date: 22-Feb-2025 <small>(DD-MMM-YYYY)</small>



เอกสารสอบเทียบการตรวจวัดระดับเสียงที่ขอบเขตรั้วพื้นที่โรงงาน



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-67/0304

**MTC No.** EEL. BP. 109/0267

## CALIBRATION CERTIFICATE

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

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

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

**Instrument Calibrated :**

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

**Ambient Environment**

Temperature : (23 + 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

**Standards used :**

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N4106495.
7. Condenser Microphone B&K 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** : 22 Feb. 2024

**Date of Calibration** : 4 Mar. 2024

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.4

**Head Office**

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

Tel. (66) 0 2577 9000

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

**Office/Laboratory**

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Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

**Office**

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand

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

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

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 $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20 $\mu$ 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	93.85	-0.15	$\pm 0.10$	$\pm 0.75$ 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	999.9	-0.1	$\pm 1.5$	$\pm 2.0\%$

### 3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.65	$\pm 0.50$	$\pm 4.0\%$

Note : 1. No adjustment.


2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

  
.....  
(Mr. Weerachai Deechaiyae)

Approved by :

  
.....  
(Mr. Prawate Kluaypa)  
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 4 Mar. 2024

Date of Issue : 5 Mar. 2024

Ref : 2011267022200795001

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.

#### Head Office

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

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

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

#### Office/Laboratory

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Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

#### Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand

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

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th





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

Noise R\_202/25

## 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	21 February 2025
		Due Date	21 February 2026

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R15	ACO	6236	00172062	03 April 2025	93.9	93.9
ACO-R19	ACO	6236	00182001	03 April 2025	94.0	93.9
ACO-R21	ACO	6236	00182004	03 April 2025	93.9	93.9
ACO-R22	ACO	6236	00182010	03 April 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)

เอกสารสอบเทียบการตรวจวัดระดับเสียงในพื้นที่ทำงาน



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0304

MTC No. EEL. BP. 109/0267

## CALIBRATION CERTIFICATE

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

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

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

### Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

### Ambient Environment

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

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

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

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.  
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.  
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.  
4. Digital Multimeter Agilent 34401A S/N MY44005560.  
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.  
6. Audio Analyzer Keithley 2015-P S/N4106495.  
7. Condenser Microphone B&K 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 : 22 Feb. 2024

Date of Calibration : 4 Mar. 2024

1 / 2

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

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FM.BL.MTC.002 Rev.4

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

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Thailand

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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



**Request No.** 21-67/0304

**MTC No.** EEL. BP. 109/0267

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 $\mu$ Pa at 1000 Hz**

**Acoustic Output in dB re 20 $\mu$ 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	93.85	-0.15	$\pm 0.10$	$\pm 0.75$ 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	999.9	-0.1	$\pm 1.5$	$\pm 2.0\%$

**3. Total Distortion**

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.65	$\pm 0.50$	$\pm 4.0\%$

**Note :** 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

**Calibrated by :**

.....  
(Mr. Weerachai Deechaiyae)

**Approved by :**

.....  
(Mr. Prawate Kluaypa)  
Director

**Electrical and Electronic Standards Laboratory**

**Industrial Metrology and Testing Service Centre**

**Date of Calibration** : 4 Mar. 2024

**Date of Issue** : 5 Mar. 2024

**Ref :** 2011267022200795001

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.

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

Noise R\_038/25

## 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	04 March 2024
		Due Date	04 March 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-R09	ACO	6236	00172035	19 January 2025	93.9	93.9
ACO-R19	ACO	6236	00182001	19 January 2025	93.9	93.9
ACO-R21	ACO	6236	00182004	19 January 2025	93.9	93.9
ACO-R22	ACO	6236	00182010	19 January 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.85 ± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr.Adul Dangklom )

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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

Noise R\_214-1/25

## 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	21 February 2025
		Due Date	21 February 2026

### Calibration Data

#### Sound Level Meter Data

#### Calibration Data

#### Actual Reading [dB]

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B43	ACO	6236	00192034	22 April 2025	93.9	93.9

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

93.81 ± 0.10 dB

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(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

Noise R\_214/25

## 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	21 February 2025
		Due Date	21 February 2026

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
ACO-B33	ACO	6236	00182015	10 April 2025	93.9	93.9
ACO-B36	ACO	6236	00192027	10 April 2025	94.0	93.9
ACO-B41	ACO	6236	00192032	10 April 2025	93.9	93.9
ACO-B43	ACO	6236	00192034	10 April 2025	93.9	93.9
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.81 ± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0562

MTC No. EEL. BP. 71/0767

## CALIBRATION CERTIFICATE

Submitted by : S.P.S Consulting Services 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. : 33137

### 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 Bruel&Kjaer 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 : 31 Jul. 2024

Date of Calibration : 6 Aug. 2024

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

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-67/0562

**MTC No.** EEL. BP. 71/0767

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 $\mu$ Pa at 1000 Hz**

**Acoustic Output in dB re 20 $\mu$ 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 Brüel&Kjær 4180	113.50	-0.50	$\pm 0.10$	$\pm 0.75$ dB

**2. Frequency**

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

**3. Total Distortion**


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjær 4180	0.48	$\pm 0.50$	$\pm 4.0\%$

**Note :** 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

**Calibrated by :**

  
.....  
(Mr. Weerachai Deechaiyae)

**Approved by :**

  
.....  
(Mr. Prawate Kluaypa)

**Director**

**Electrical and Electronic Standards Laboratory**

**Industrial Metrology and Testing Service Centre**

**Date of Calibration** : 6 Aug. 2024

**Date of Issue** : 7 Aug. 2024

**Ref :** 2011267073102836002

End of Certificate

2 / 2

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FM.BL.MTC.002 Rev.5

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

Noise Dose R\_065/25

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 01/60
Model	SV34	Serial No.	33137
Calibration Range	114 dB, 1000 Hz	Last Calibration	06 August 2024
		Due Date	06 August 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-B10	SVANTEK	SV-104IS	80830	22 January 2025	113.5	113.5
NMD-B11	SVANTEK	SV-104IS	80831	22 January 2025	113.5	113.5
NMD-B12	SVANTEK	SV-104IS	80832	22 January 2025	113.5	113.5
NMD-B13	SVANTEK	SV-104IS	80834	22 January 2025	113.6	113.5
NMD-B14	SVANTEK	SV-104IS	80875	22 January 2025	113.5	113.5
NMD-B15	SVANTEK	SV-104IS	80880	22 January 2025	113.5	113.5
NMD-B16	SVANTEK	SV-104IS	106120	22 January 2025	113.5	113.5
NMD-B17	SVANTEK	SV-104IS	106122	22 January 2025	113.6	113.5
NMD-R22	SVANTEK	SV-104IS	80801	22 January 2025	113.5	113.5
NMD-R26	SVANTEK	SV-104IS	80836	22 January 2025	113.5	113.5
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					113.50± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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

Noise Dose R\_232-1/25

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

Brand SVANTEK

Number SV 01/60

Model SV34

Serial No. 33137

Calibration Range 114 dB, 1000 Hz

Last Calibration 06 August 2024

Due Date 06 August 2025

### Calibration Data

#### Sound Level Meter Data

#### Calibration Data

SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-R26	SVANTEK	SV-104IS	80836	22 April 2025	113.5	113.5
NMD-R35	SVANTEK	SV-104IS	80873	22 April 2025	113.5	113.5


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

113.50± 0.10 dB

Calibrated by :

  
(Mr. Adul Dangklom)

Approved by :

  
(Mr. Peera Detudom)



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Noise Dose R\_232/25

## Noise Dose Meter Calibration Report

### Acoustic Calibrator Data

Brand	SVANTEK	Number	SV 01/60
Model	SV34	Serial No.	33137
Calibration Range	114 dB, 1000 Hz	Last Calibration	06 August 2024
		Due Date	06 August 2025

### Calibration Data

Sound Level Meter Data				Calibration Data		
SLM No.	Brand	Model	Serial No.	Date	Actual Reading [dB]	
					Before Adjustment	After Adjustment
NMD-B01	SVANTEK	SV-104IS	80840	10 April 2025	113.5	113.5
NMD-B02	SVANTEK	SV-104IS	80842	10 April 2025	113.5	113.5
NMD-B03	SVANTEK	SV-104IS	80852	10 April 2025	113.6	113.5
NMD-B04	SVANTEK	SV-104IS	80854	10 April 2025	113.5	113.5
NMD-B05	SVANTEK	SV-104IS	80856	10 April 2025	113.5	113.5
NMD-B06	SVANTEK	SV-104IS	80816	10 April 2025	113.6	113.5
NMD-B07	SVANTEK	SV-104IS	80817	10 April 2025	113.5	113.5
NMD-B20	SVANTEK	SV-104IS	106131	10 April 2025	113.5	113.5
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					113.50± 0.10 dB	

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



เอกสารสอบเทียบการตรวจวัดคุณภาพอากาศในสถานที่ทำงาน



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

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

### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

#### Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
B01	SKC	224-PCXR4	262101	01/04/2025	1,000	1,500	2,000	998	1,494	2,002	1.001x - 3.594	1.000
B02	SKC	224-PCXR4	626166	01/04/2025	1,000	1,500	2,000	995	1,508	2,003	1.008x - 12.605	1.000
B03	SKC	224-PCXR4	612968	03/04/2025	1,000	1,500	2,000	1,003	1,502	2,006	1.006x - 7.796	1.000
B04	SKC	224-PCXR4	602804	03/04/2025	1,000	1,500	2,000	1,001	1,499	2,013	1.004x - 7.060	0.999
B05	SKC	224-PCXR4	612693	03/04/2025	1,000	1,500	2,000	1,004	1,498	2,007	1.003x - 2.455	1.000
B06	SKC	224-PCXR4	262188	03/04/2025	1,000	1,500	2,000	1,003	1,512	2,004	1.000x + 0.696	1.000
B07	SKC	224-PCXR4	626262	03/04/2025	1,000	1,500	2,000	1,012	1,504	1,996	0.994x + 10.330	0.999
B08	SKC	224-PCXR4	626100	02/04/2025	1,000	1,500	2,000	996	1,511	2,007	1.010x - 14.048	1.000
B09	SKC	224-PCXR4	626479	03/04/2025	1,000	1,500	2,000	999	1,510	2,003	1.003x - 4.677	1.000
B10	SKC	224-PCXR4	091950	03/04/2025	1,000	1,500	2,000	1,002	1,498	2,004	1.004x - 6.544	1.000
B11	SKC	224-PCXR8	564315	04/04/2025	1,000	1,500	2,000	1,013	1,505	2,010	1.002x + 2.171	1.000
B12	SKC	224-PCXR4	034656	04/04/2025	1,000	1,500	2,000	1,004	1,506	2,009	1.008x - 9.391	1.000
B13	SKC	224-PCXR4	602073	03/04/2025	1,000	1,500	2,000	1,001	1,497	2,012	1.009x - 9.643	1.000
B14	SKC	224-PCXR4	626313	03/04/2025	1,000	1,500	2,000	1,004	1,515	1,997	1.002x - 1.275	0.999
B15	SKC	224-PCXR4	626474	03/04/2025	1,000	1,500	2,000	999	1,497	1,996	1.000x - 2.511	1.000
B16	SKC	224-PCXR4	626477	03/04/2025	1,000	1,500	2,000	1,012	1,504	2,007	0.997x + 8.160	1.000
B17	SKC	224-PCXR4	626860	01/04/2025	1,000	1,500	2,000	997	1,506	1,999	1.001x - 1.435	1.000
B18	SKC	224-PCXR4	691484	02/04/2025	1,000	1,500	2,000	1,007	1,493	2,005	0.998x + 4.350	1.000
B19	SKC	224-PCXR4	691599	03/04/2025	1,000	1,500	2,000	1,004	1,513	2,001	1.003x - 2.043	1.000
B20	SKC	224-PCXR4	691587	03/04/2025	1,000	1,500	2,000	999	1,504	1,998	0.999x + 0.556	1.000
B21	SKC	224-PCXR4	691531	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,997	1.003x - 7.572	0.999
B22	SKC	224-PCXR4	691654	04/04/2025	1,000	1,500	2,000	1,008	1,504	2,006	1.005x - 4.941	1.000
B23	SKC	224-PCXR4	798393	04/04/2025	1,000	1,500	2,000	995	1,499	1,998	1.002x - 4.953	1.000
B24	SKC	224-PCXR4	626363	04/04/2025	1,000	1,500	2,000	1,002	1,501	1,996	0.999x - 1.539	1.000
B25	SKC	224-PCXR4	798489	04/04/2025	1,000	1,500	2,000	1,010	1,515	2,001	0.990x + 16.203	0.999
B26	SKC	224-PCXR4	798479	03/04/2025	1,000	1,500	2,000	999	1,492	1,999	0.998x - 0.596	1.000
B27	SKC	224-PCXR4	691673	03/04/2025	1,000	1,500	2,000	996	1,498	2,002	1.004x - 6.496	1.000
B28	SKC	224-PCXR4	691570	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,994	0.993x + 8.068	1.000
B29	SKC	224-PCXR4	626472	03/04/2025	1,000	1,500	2,000	1,001	1,501	1,996	0.994x + 9.367	1.000
B30	SKC	224-PCXR4	691489	01/04/2025	1,000	1,500	2,000	996	1,507	2,003	1.006x - 12.489	1.000
B31	SKC	224-PCXR4	691509	02/04/2025	1,000	1,500	2,000	1,010	1,509	2,008	1.003x - 3.858	0.999
B32	SKC	224-PCXR4	091567	02/04/2025	1,000	1,500	2,000	996	1,497	1,997	0.998x - 0.764	1.000
B33	SKC	224-PCXR4	091756	03/04/2025	1,000	1,500	2,000	998	1,508	2,006	1.007x - 13.441	0.999
B34	SKC	224-PCXR4	612962	03/04/2025	1,000	1,500	2,000	1,004	1,494	1,995	0.993 + 8.471	1.000
B35	SKC	224-PCXR4	602682	03/04/2025	1,000	1,500	2,000	999	1,491	2,001	1.000x - 2.275	1.000
B36	SKC	224-PCXR4	626164	03/04/2025	1,000	1,500	2,000	1,004	1,499	1,997	0.995x + 5.109	1.000
B37	SKC	224-PCXR4	626256	03/04/2025	1,000	1,500	2,000	998	1,503	1,996	0.996x + 5.729	1.000
B38	SKC	224-PCXR4	626167	03/04/2025	1,000	1,500	2,000	996	1,509	2,004	1.008x - 15.248	0.999
B39	SKC	224-PCXR4	034637	02/04/2025	1,000	1,500	2,000	1,006	1,505	2,010	1.011x - 15.064	0.999
B40	SKC	224-PCXR4	798349	03/04/2025	1,000	1,500	2,000	997	1,510	2,008	1.012x - 19.381	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

Peera Detudom  
(Mr. Peera Detudom)



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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R <sup>2</sup>
H-B01	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	499.1	997.5	1996.2	0.992x + 10.557	1.000
H-B02	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	501.5	996.9	2004.4	1.002x - 0.966	1.000
H-B03	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	498.9	997.4	1996.5	0.997x - 0.674	1.000
H-B04	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	498.0	996.5	2007.8	1.001x - 8.142	0.999
H-B05	Dwyer	VFB-65	02/04/2025	500	1,000	2,000	501.2	998.6	1993.7	0.994x + 6.199	1.000
H-B06	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	499.7	995.3	1989.1	0.995x + 1.374	0.999
H-B07	Dwyer	VFB-65	03/04/2025	500	1,000	2,000	500.1	999.7	2006.4	0.998x - 1.014	1.000
H-B08	Dwyer	VFB-65	01/04/2025	500	1,000	2,000	499.8	997.4	1994.8	0.993x + 6.689	1.000
H-B09	Dwyer	VFB-65	04/04/2025	500	1,000	2,000	498.2	997.1	2005.6	0.999x + 0.065	0.999
H-B10	Dwyer	VFB-65	04/04/2025	500	1,000	2,000	501.2	998.4	2009.2	0.998x + 3.713	1.000

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

### Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

#### Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R <sup>2</sup>
R01	SKC	224-PCXR4	602467	02/04/2025	1,000	1,500	2,000	1,003	1,506	2,001	1.003x - 1.855	1.000
R02	SKC	224-PCXR4	626450	02/04/2025	1,000	2,000	3,000	994	1,501	2,002	1.006x - 11.866	1.000
R03	SKC	224-PCXR4	691592	01/04/2025	1,000	1,500	2,000	995	1,509	2,007	1.013x - 22.400	0.999
R04	SKC	224-PCXR4	691672	02/04/2025	1,000	1,500	2,000	996	1,502	1,996	0.999x + 0.668	1.000
R05	SKC	224-PCXR4	798470	04/04/2025	1,000	1,500	2,000	995	1,511	2,005	1.010x - 16.711	0.999
R06	SKC	224-PCXR4	798456	04/04/2025	1,000	1,500	2,000	1,002	1,499	2,003	1.004x - 5.745	1.000
R07	SKC	224-PCXR4	798480	04/04/2025	1,000	1,500	2,000	1,005	1,504	2,007	1.011x - 16.099	0.999
R08	SKC	224-PCXR4	883215	04/04/2025	1,000	1,500	2,000	1,002	1,503	2,004	1.014x - 23.623	0.999
R09	SKC	224-PCXR4	034650	02/04/2025	1,000	1,500	2,000	999	1,497	2,011	1.009x - 11.282	1.000
R10	SKC	224-PCXR4	091765	01/04/2025	1,000	1,500	2,000	1,002	1,505	2,003	1.012x - 20.705	0.999
R11	SKC	224-PCXR4	091763	02/04/2025	1,000	1,500	2,000	997	1,504	2,005	1.005x - 4.550	1.000
R12	SKC	224-PCXR4	091568	02/04/2025	1,000	1,500	2,000	998	1,513	2,004	1.015x - 25.798	0.999
R13	SKC	224-PCXR4	091638	03/04/2025	1,000	1,500	2,000	996	1,502	1,999	1.003x - 5.821	1.000
R14	SKC	224-PCXR4	091764	03/04/2025	1,000	1,500	2,000	1,002	1,503	1,997	0.997x + 5.785	1.000
R15	SKC	224-PCXR8	529457	01/04/2025	1,000	1,500	2,000	996	1,501	2,001	1.002x - 5.453	1.000
R16	SKC	224-PCXR8	529643	02/04/2025	1,000	1,500	2,000	999	1,506	1,998	0.998x + 4.829	1.000
R17	SKC	224-PCXR8	529645	02/04/2025	1,000	1,500	2,000	993	1,504	2,004	1.009x - 19.210	1.000
R18	SKC	224-PCXR8	566756	04/04/2025	1,000	1,500	2,000	1,005	1,503	2,008	1.007x - 9.639	1.000
R19	SKC	224-PCXR8	566802	04/04/2025	1,000	1,500	2,000	996	1,495	1,997	1.000x - 2.051	1.000
R20	SKC	224-PCXR8	529089	02/04/2025	1,000	1,500	2,000	999	1,498	1,999	1.004x - 12.497	1.000
R21	SKC	224-PCXR8	665728	02/04/2025	1,000	1,500	2,000	994	1,502	1,996	1.000x - 2.818	1.000
R22	SKC	224-PCXR8	707444	03/04/2025	1,000	1,500	2,000	999	1,507	2,004	1.009x - 16.603	0.999
R23	SKC	224-PCXR8	761067	03/04/2025	1,000	1,500	2,000	997	1,496	1,997	1.001x - 3.342	1.000
R24	SKC	224-PCXR8	707893	02/04/2025	1,000	1,500	2,000	1,005	1,504	2,012	1.008x - 11.430	0.999
R25	SKC	224-PCXR8	761052	01/04/2025	1,000	1,500	2,000	1,002	1,493	2,010	1.006x - 8.771	1.000
R26	SKC	224-PCXR8	707956	02/04/2025	1,000	1,500	2,000	997	1,504	1,997	1.001x - 2.663	1.000
R27	SKC	224-PCXR8	707398	02/04/2025	1,000	1,500	2,000	996	1,495	2,001	1.007x - 19.305	0.999
R28	SKC	224-PCXR8	707481	03/04/2025	1,000	1,500	2,000	1,013	1,507	2,004	0.996x + 9.887	1.000
R29	SKC	224-PCXR8	707402	04/04/2025	1,000	1,500	2,000	998	1,499	2,010	1.010x - 19.297	1.000
R30	SKC	224-PCXR8	093811	02/04/2025	1,000	1,500	2,000	1,008	1,505	2,008	1.006x - 6.261	1.000
R31	SKC	224-PCXR8	093183	02/04/2025	1,000	1,500	2,000	1,002	1,501	1,994	0.998x - 0.140	1.000
R32	SKC	224-PCXR8	671950	01/04/2025	1,000	1,500	2,000	1,001	1,498	1,997	0.997x + 3.786	1.000
R33	SKC	224-PCXR4	626254	01/04/2025	1,000	1,500	2,000	1,006	1,497	2,001	0.995x + 7.736	1.000
R34	SKC	224-PCXR4	626131	01/04/2025	1,000	1,500	2,000	994	1,506	2,006	1.009x - 17.998	1.000
R35	SKC	224-PCXR8	707460	01/04/2025	1,000	1,500	2,000	1,006	1,505	2,014	1.010x - 14.668	0.999
R36	SKC	224-PCXR8	707446	04/04/2025	1,000	1,500	2,000	998	1,500	1,995	1.000x - 2.067	1.000
R37	SKC	224-PCXR8	707432	02/04/2025	1,000	1,500	2,000	1,005	1,494	2,006	0.998x + 4.721	1.000
R38	SKC	224-PCXR8	707349	03/04/2025	1,000	1,500	2,000	996	1,511	2,007	1.012x - 19.485	0.999
R39	SKC	224-PCXR8	761095	02/04/2025	1,000	1,500	2,000	1,005	1,505	2,008	1.004x - 4.026	1.000

Calibrated by :

Adul Dangklom  
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

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 <sup>2</sup>
L-R01	Dwyer	VFA-21	02/04/2025	50	100	200	50.7	101.0	199.3	0.995x + 1.197	1.000
L-R02	Dwyer	VFA-21	02/04/2025	50	100	200	49.8	100.7	199.1	1.001x - 0.303	1.000
L-R03	Dwyer	VFA-21	01/04/2025	50	100	200	50.1	101.2	200.9	1.005x - 0.447	0.999
L-R04	Dwyer	VFA-21	04/04/2025	50	100	200	50.2	100.9	201.5	0.994x + 1.311	1.000
L-R05	Dwyer	VFA-21	04/04/2025	50	100	200	50.4	100.7	201.6	0.999x + 0.781	1.000
L-R06	Dwyer	VFA-21	03/04/2025	50	100	200	49.8	101.2	201.8	1.003x - 0.149	0.999

Calibrated by :

Adul Dangklom  
 (Mr.Adul Dangklom)

Approved by :

Peera Detudom  
 (Mr. Peera Detudom)



## GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0824/22063

Instrument Type : Gas Chromatography

Model : CP-3800

Serial Number : 00734

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

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

Date : 05/08/2024

### ELECTRONIC TEST

CPU	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
LCD TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
VENT TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
KEY ECHO TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
DESTRUCTION RAM TEST	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

### RUN CHROMATOGRAM TEST

DETECTOR : Flame Ionization Detector ( FID Channel Front)

INJECTOR : Capillary Injector Model 1079

#### 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 0.218 g/L C14, C15, C16 in hexane

SENSITIVITY TEST: C15. ( Area count ) = 156,955 Counts.





**Detector Sensitivity ( FID )**

Detector Response	Result	Specification
Baseline Noise ( $\mu$ V)	2.85	$\leq 50$
Baseline Drift (%)	0.09	$\leq 1$
Sensitivity ( S/N for C15)	16,400	$\geq 1,024$

**Temperature Specification**

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

**Relative Standard Deviation % ( % RSD)**

Checkout Procedure	Result	Specification
Area C15 ( %)	1.71	$\leq 5$
Retention Time C15( %)	0	$\leq 0.5$

APPROVAL :

Signature: Suwarot.Engineer : Suwarot TrikainutDate : 05/08/2024



บริษัท ไทยยูนิค จำกัด

THAI UNIQUE CO., LTD.

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

### Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 Area 1	157,309
C15 Area 2	159,359
C15 Area 3	157,349
C15 Area 4	152,379
C15 Area 5	158,379
C15 Area Average	156,955
* % RSD ( < 5 % )	1.71

\* 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	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	Samarot.	
Date	05/08/2567	



Comments	-		
Reviewed by	Samar P.	Date	05/08/2024



VARIAN



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

### Results Integrated System Testing

Checkout Procedure	FID
Detector Position	Front
Inlet Type	1079 Injector
C15 RT 1	4.128
C15 RT 2	4.128
C15 RT 3	4.128
C15 RT 4	4.128
C15 RT 5	4.128
C15 RT Average	4.128
* % RSD ( < 0.5 % )	0

\* 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	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	Sunnarot.	
Date	05/08/2024	



Comments	-		
Reviewed by	Sunnarot P.	Date	05/08/2024



VARIAN



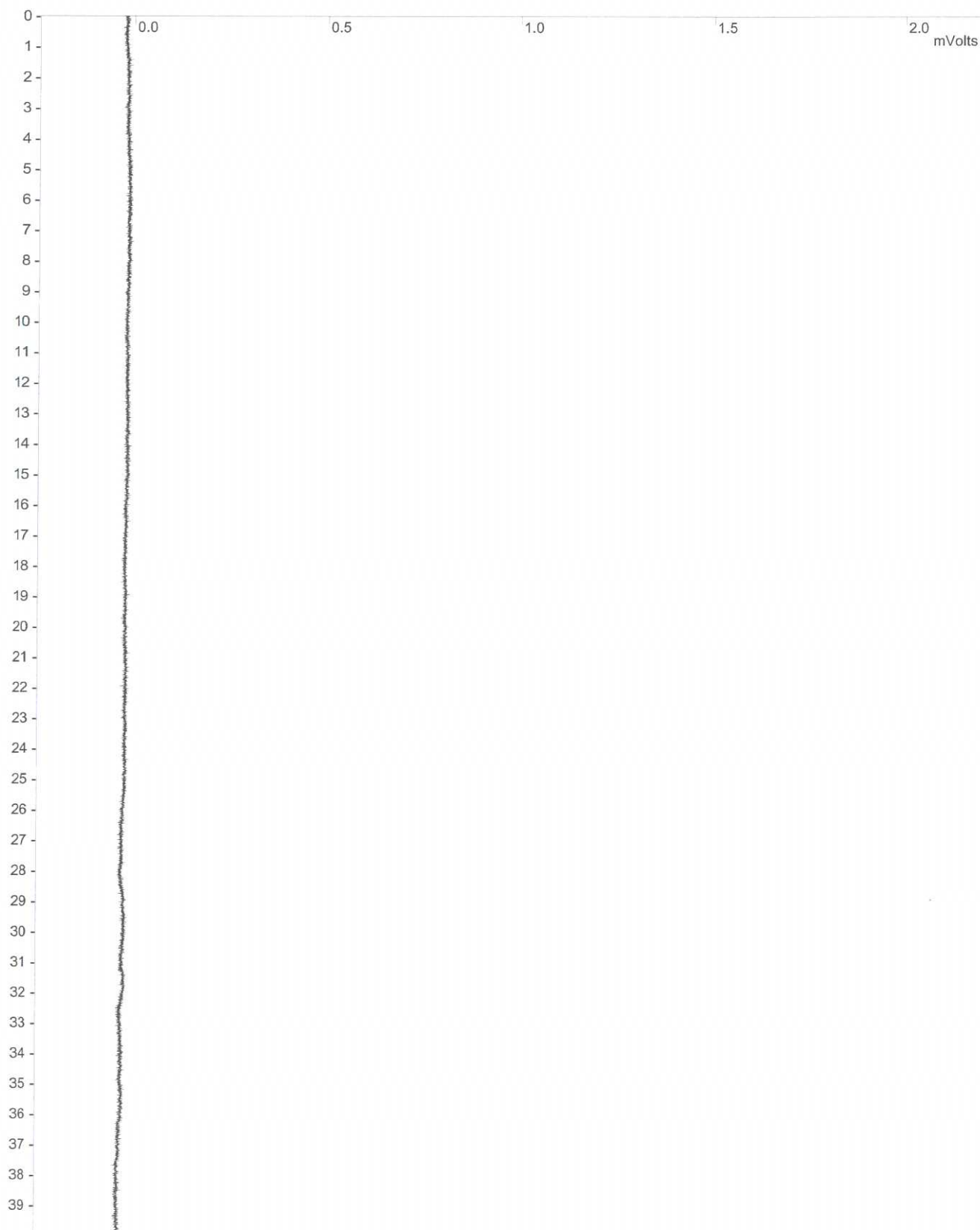
Title :  
Run File : f:\ \sps2024\cal2024\baseline2024002.run  
Method File : D:\Method-GC\star C\Star\TU\cal0203\baseline FID.mth  
Sample ID : Baseline2024

Injection Date: 5/8/2567 14:01      Calculation Date: 5/8/2567 14:41

Operator : watsamon      Detector Type: 3800 (10 Volts)  
Workstation: Local Disk      Bus Address : 44  
Instrument :      Sample Rate : 10.00 Hz  
Channel : Front = FID      Run Time : 39.960 min

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

Chart Speed = 0.56 cm/min      Attenuation = 1      Zero Offset = 10%  
Start Time = 0.000 min      End Time = 39.960 min      Min / Tick = 1.00



Title :  
Run File : f:\ \sps2024\cal2024\baseline2024002.run  
Method File : D:\Method-GC\star C\Star\TU\cal0203\baseline FID.mth  
Sample ID : Baseline2024

Injection Date: 5/8/2567 14:01 Calculation Date: 5/8/2567 14:41

Operator : suwarot Detector Type: 3800 (10 Volts)  
Workstation: Local Disk Bus Address : 44  
Instrument : Sample Rate : 10.00 Hz  
Channel : Front = FID Run Time : 39.960 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: -16 microVolts LSB: 1 microVolts

Noise (used): 22 microVolts - monitored before this run

Manual injection

Data Handling: No peaks

\*\*\*\*\*

Title :  
Run File : f:\sps2024\cal2024\fid2024003.run  
Method File : d:\cafid2024003-front.mth  
Sample ID : FID2024

Injection Date: 5/8/2567 9:16

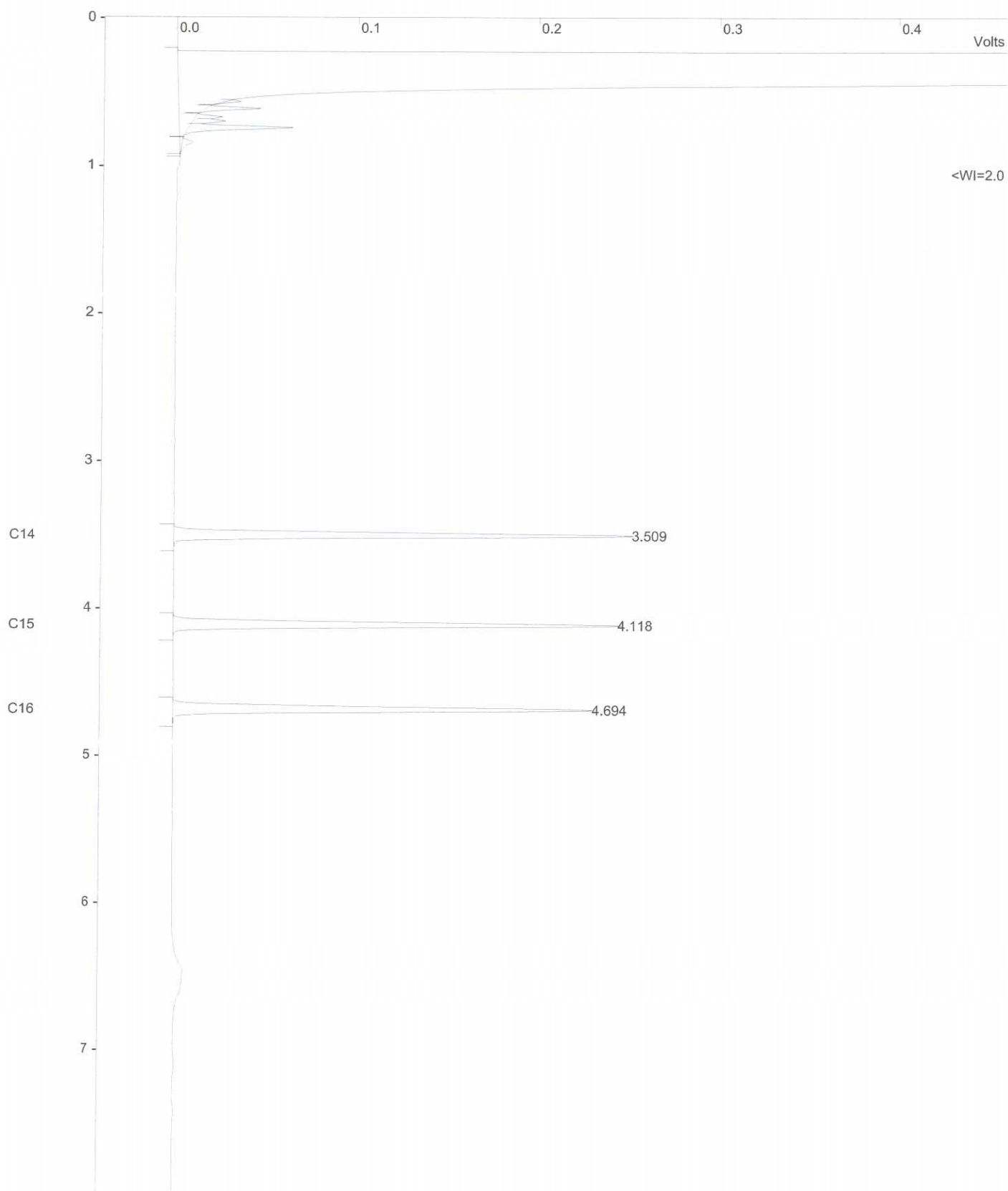
Calculation Date: 5/8/2567 9:26

Operator : suwarot  
Workstation: GC-LAB  
Instrument :  
Channel : Front = FID

Detector Type: 3800 (10 Volts)  
Bus Address : 44  
Sample Rate : 10.00 Hz  
Run Time : 7.993 min

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

Chart Speed = 2.83 cm/min    Attenuation = 205    Zero Offset = 8%  
Start Time = 0.000 min    End Time = 7.993 min    Min / Tick = 1.00





Title :  
Run File : f:\ \sps2024\cal2024\fid2024003.run  
Method File : d:\fid2024003-front.mth  
Sample ID : FID2024

Injection Date: 5/8/2567 9:16 Calculation Date: 5/8/2567 9:26

Operator : suwarot 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 : 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
1	C14	54.1202	3.509	-0.005	163565	BB	2.1	C
2	C15	53.5241	4.118	-0.005	157309	BB	2.2	C
3	C16	52.2361	4.694	0.001	146804	BB	2.3	C
Totals:		159.8804		-0.009	1704289			

Status Codes:  
C - Out of calibration range

Total Unidentified Counts : 69332200 counts

Detected Peaks: 11 Rejected Peaks: 0 Identified Peaks: 3

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: -29 microVolts LSB: 1 microVolts

Noise (used): 28 microVolts - monitored before this run

Manual injection

Calib. out of range; No Recovery Action Specified

\*\*\*\*\*



Sample ID: **fid std**

Operator (Inj): suwarot

Injection Date: 05/08/2024

Calc Date: 05/08/2024

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):



**VARIAN**

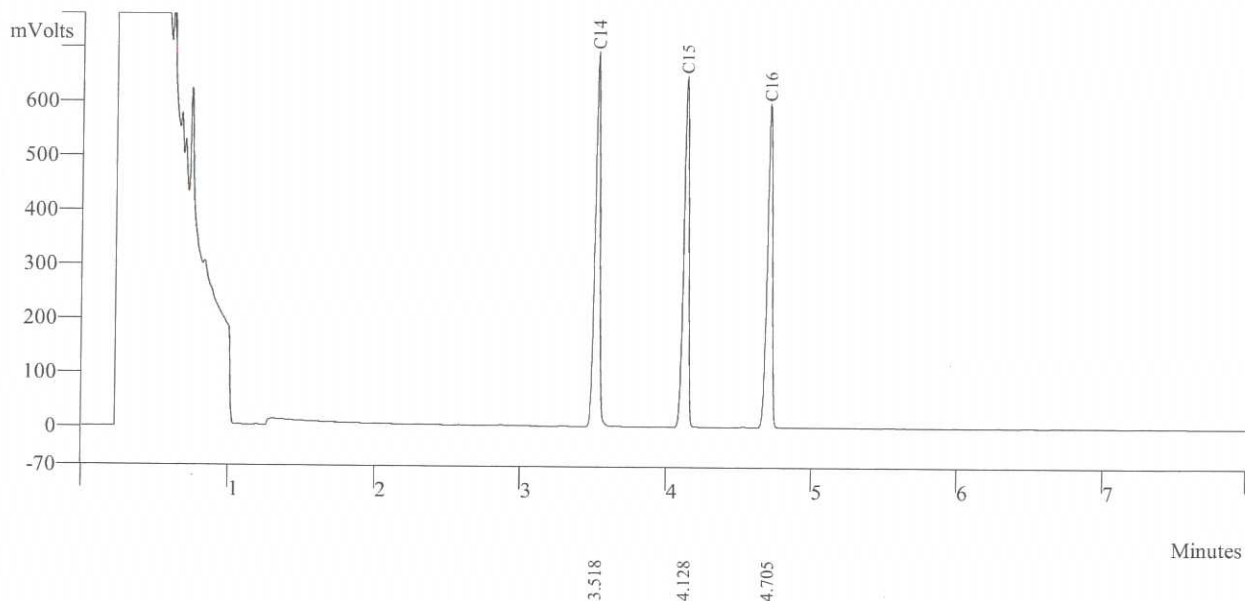
Run Mode: Analysis

Peak Measurement: Peak Area

Calculation Type: External Std.

c:\star\data\tu\cal2024\fid2024002.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	152.6865	3.518	168565	BB	2.2
2	C15	137.1189	4.128	159359	BB	2.3
3	C16	128.7997	4.705	147834	BB	2.3
Totals		418.6042		475758		



Sample ID:       **fid std**

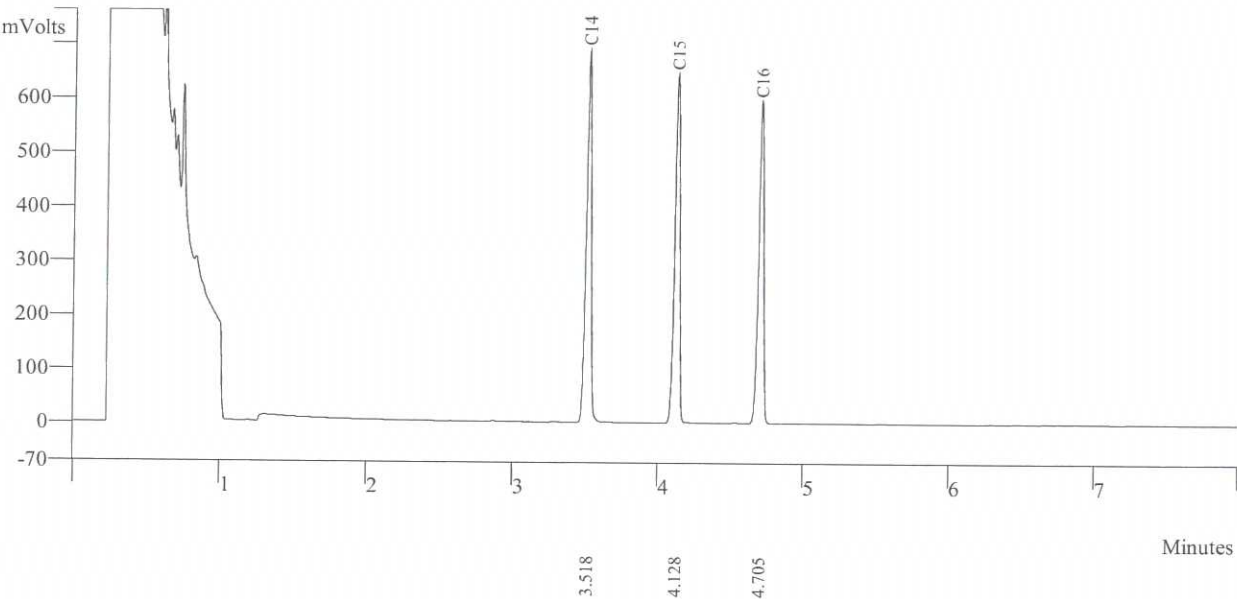
Operator (Inj):     suwarot  
Injection Date:     05/08/2024  
Calc Date:         05/08/2024  
Run Time (min):    7.993  
Workstation:        GC-LAB  
Instrument (Inj):



Run Mode:            Analysis  
Peak Measurement: Peak Area  
Calculation Type:    External Std.

c:\star\data\tu\cal2024\fid2024003.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	152.7865	3.518	169535	BB	2.2
2	C15	197.1159	4.128	157349	BB	2.3
3	C16	128.5997	4.705	149834	BB	2.3
	Totals	478.5021		476718		



Sample ID:       **fid std**

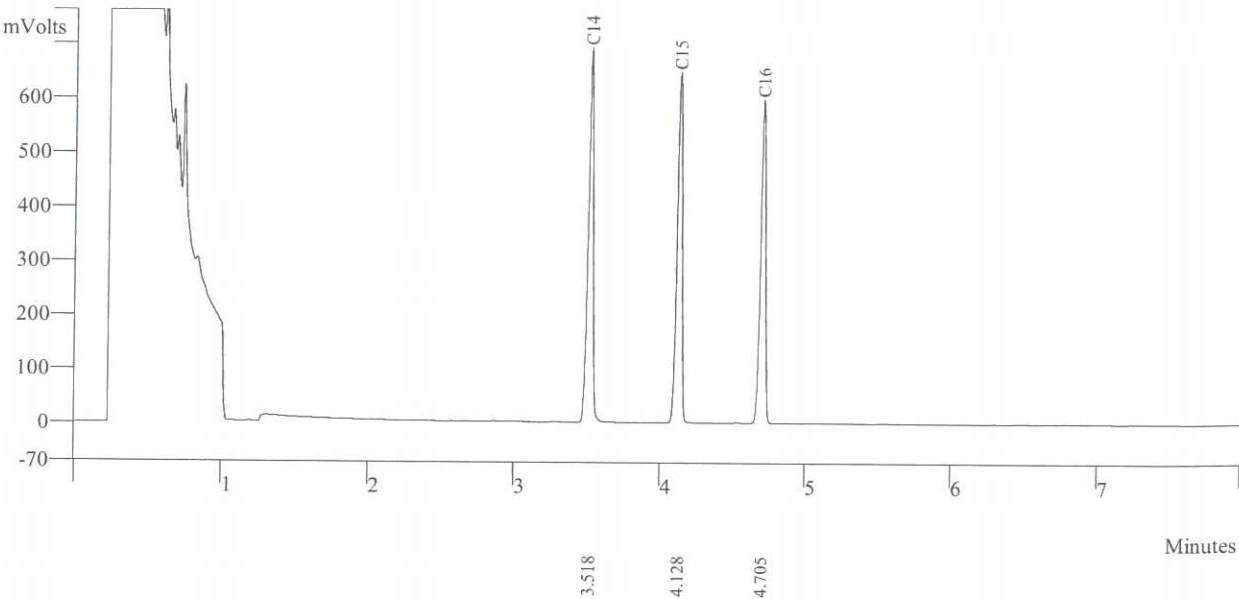
Operator (Inj):    suwarot  
Injection Date:    05/08/2024  
Calc Date:        05/08/2024  
Run Time (min):   7.993  
Workstation:       GC-LAB  
Instrument (Inj):



Run Mode:         Analysis  
Peak Measurement: Peak Area  
Calculation Type: External Std.

c:\star\data\tu\cal2024\fid2024004.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	162.7865	3.518	165521	BB	2.2
2	C15	157.1159	4.128	152379	BB	2.3
3	C16	138.5997	4.705	146834	BB	2.3
Totals		458.5021		464734		



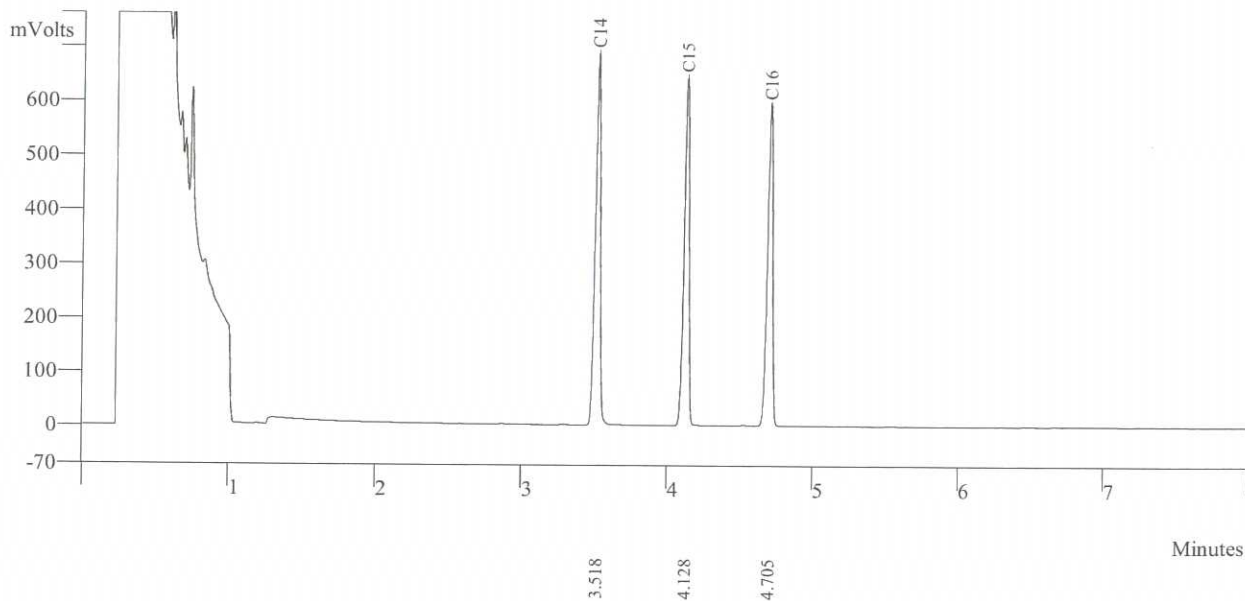
Sample ID: fid std

Operator (Inj): suwarot  
Injection Date: 05/08/2024  
Calc Date: 05/08/2024  
Run Time (min): 7.993  
Workstation: GC-LAB  
Instrument (Inj):

  
**VARIAN**

Run Mode: Analysis  
Peak Measurement: Peak Area  
Calculation Type: External Std.

c:\star\data\tu\cal2024\fid2024005.runA = FID 10 V RESULTS



Peak No	Peak Name	Result ()	Ret Time (min)	Peak Area (counts)	Sep. Code	Width 1/2 (sec)
1	C14	162.7965	3.518	164521	BB	2.2
2	C15	137.1159	4.128	158379	BB	2.3
3	C16	128.1947	4.705	149834	BB	2.3
Totals		428.1071		472734		







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

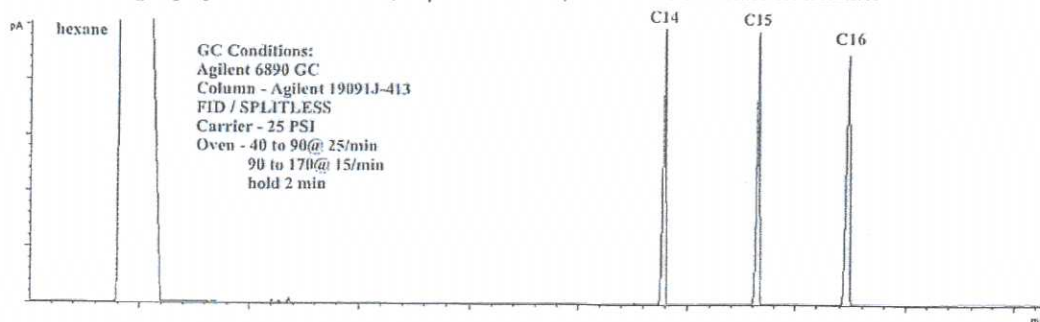
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

#### 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  
QMS Representative



## Certificate of Calibration

Certificate No.: WK2312-031-1

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 : 6-Dec-23  
Calibrated Date : 7-Dec-23  
Issued Date : 12-Dec-23  
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	WK2305-049-5	22-May-24	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.Taywanat Hansuwankul

Approved by :

Ms. Budsagorn Patcha  
Authorized Signatory



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## Calibration Results

Certificate No. : WK2312-031-1

Page 2 of 2

### Calibration Result of the Accuracy

Function : Flow Measurement

Range : 0 ml/min to 750 ml/min

Resolution : 0.01 / 0.1 / 1 ml/min

Unit : ml/min

UUC Setting		STD Reading	Error	Uncertainty ( $\pm$ )	Tolerance Limit Values (ml/min)
Scale	ml/min				
0	0.00	0.00	0.00	3.3	-0.20 ~ 0.20
50	50.7	51.15	-0.45	3.3	48.80 ~ 51.20
300	300	300.4	-0.4	3.3	293.8 ~ 306.2
450	450	450.7	-0.7	3.3	440.8 ~ 459.2
550	550	549.5	0.5	3.3	533.5 ~ 566.5
650	650	649.3	0.7	3.3	630.5 ~ 669.5
700	700	699.2	0.8	3.3	679.0 ~ 721.0

(X) Without Adjustment ( ) After Adjustment

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\*\*\*\* End of Certificate\*\*\*\*





**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 : LF24-0278  
Equipment : Thermometer  
Manufacturer : Fluke  
Model : 51  
Serial Number : 5910857  
Asset Number : 5910857  
Customer : Thai Unique Co., Ltd.  
80-82 Prachathipatai Road,  
Bangkhunphrom, Pranakorn,  
Bangkok 10200  
Date of Calibrate : 26-Jun-2024  
Date of Issue : 27-Jun-2024

*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

*Nanthiya Ngampring*

Mrs. Nanthiya Ngampring  
Metrology Technician

Approved by

*A B.*

Mrs. Arunee Bamrungtham  
Cal-Lab Manager



Measuretronix Limited

## Calibration Report

### UUC : Fluke 51 Thermometer

Serial No. : 5910857

Asset No. : 5910857

Procedure : CP-LF-04:Rev.02

Note : Refer to Fluke 51,52 Operator's Manual Rev 1 3/86, Oct 1985

Customer : Thai Unique Co., Ltd.

Address : 80-82 Prachathipatai Road,  
Bangkhunphrom, Pranakorn,  
Bangkok 10200

Certificate No. : LF24-0278

Report data type : As-Found

Date of Calibrate : 26-Jun-2024

Date of Receive : 17-Jun-2024

### Environment condition

Temperature : 23 °C ± 3 °C

Humidity : 50 %RH ± 20 %RH

*Measuretronix Cal-Lab certifies that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). The measurements are traceable to national or international measurement standards or accept fundamental or natural physical constants or have been derived by approved ratio techniques as state in the Standard Used below. The policies and procedures used comply with ISO/IEC 17025:2017.*

*This report applies only to the item identified and shall not be reproduced other than in full, without specific written approved by Measuretronix Cal-Lab.*

*The uncertainties shown are the expanded uncertainties, which calculated from the standard uncertainties multiplied by a coverage factor of  $k = 2$ , providing a measurement confidence level of approximately 95%.*

*No statement of compliance with specifications is made or implied on this certificate.*

Remark : The units of uncertainty values in this report are referred to the below details :

"Volt" or "V" for voltage, "Ampere" or "A" for current, "Ohm" or "Ω" for resistance, "Farad" or "F" for capacitance, "Hertz" or "Hz" for frequency, "deg C" or "°C" for degree Celsius, "deg F" or "°F" for degree Fahrenheit, etc.

### Standard Used

Serial/Asset	Description	Traceable	Cert.No.	Cal.Date	Due Date
6400011	Fluke 5500A Calibrator	NIMT	EE-0017-24	7-Mar-2024	6-Mar-2025

## Test Data

TEST	RANGE	Nominal Value	UUC Tol. (+/-)	Test Result	Error	Uncertainty (+/-)
THERMOCOUPLE MEASUREMENT CALIBRATION						
TYPE K THERMOCOUPLE						
1		-195.0 °C*	0.9 °C	-195.4 °C	-0.4 °C	0.27 °C
2		-100.0 °C	0.8 °C	-100.5 °C	-0.5 °C	0.21 °C
3		-50.0 °C	0.8 °C	-50.2 °C	-0.2 °C	0.21 °C
4		0.0 °C	0.7 °C	0.0 °C	0.0 °C	0.21 °C
5		100.0 °C	0.8 °C	100.1 °C	0.1 °C	0.21 °C
6		300.0 °C	1.0 °C	300.2 °C	0.2 °C	0.21 °C
7		500.0 °C	1.2 °C	500.1 °C	0.1 °C	0.21 °C
8		1365.0 °C	2.1 °C	1365.2 °C	0.2 °C	0.32 °C
TYPE J THERMOCOUPLE						
9		-195.0 °C*	1.0 °C	-194.4 °C	0.6 °C	0.22 °C
10		-100.0 °C	0.9 °C	-99.3 °C	0.7 °C	0.18 °C
11		-50.0 °C	0.9 °C	-49.4 °C	0.6 °C	0.18 °C
12		0.0 °C	0.8 °C	0.5 °C	0.5 °C	0.18 °C
13		100.0 °C	0.9 °C	100.4 °C	0.4 °C	0.18 °C
14		300.0 °C	1.1 °C	300.8 °C	0.8 °C	0.18 °C
15		755.0 °C	1.6 °C	755.3 °C	0.3 °C	0.18 °C

**End of Calibration Report**



# *Certificate*

It is hereby certified that

**Suwarot Trikainut**

Has successfully completed the Application Training for

**Basic Gas Chromatography and Sampler**

Training Contents were:

**Hardware Operation, Software Operation, Data analysis and**

**Troubleshooting : Model**

**CP-3800, 3900, 450-GC, 430-GC, 456-GC, 436-GC**

At Thai Unique Co., Ltd, Bangkok, Thailand

On 15<sup>th</sup> March, 2019




S. Pohtongkam

Service Manager

## ***GC Clarus 600/680 Preventive Maintenance (PM)***

<b>Company Name:</b>	<b>S.P.S. Consulting Service Co.,Ltd</b>		
<b>Address (Instrument Location):</b>	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
<b>Serial Number:</b>	680S14042502	<b>Service Tag:</b>	N68APSSFxMP
<b>Customer Name (if applicable):</b>	Ms.Naruecha	<b>PM number:</b>	1 of 2
<b>Service Engineer Name:</b>	Monchai Kitcharoenkeat	<b>Service Order Number:</b>	WO-
<b>Date PM Performed: (DD-MMM-YYYY)</b>	22-Feb-2025	<b>Next PM Due Date: (DD-MMM-YYYY)</b>	22-Aug-2025

<b>Part Number</b>	<b>Release</b>	<b>Publication Date</b>	
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 0.33 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>1.12</u>	mV.
Detector Channel B	<u>NA</u>	mV.

### 3. Diagnostics Tests:

- ☒ Run instrument diagnostics.
 

<input checked="" type="checkbox"/> BRAM	Pass
<input checked="" type="checkbox"/> EPROM	Pass
- ☒ Run Autosampler diagnostics.
 

<input checked="" type="checkbox"/> BRAM	Pass
<input checked="" type="checkbox"/> 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

<p><i>The preventive maintenance checks and if applicable performance tests for Clarus600/680 GC have been completed.</i></p>		
<p><i>This Clarus600/680 GC      Pass      the preventive maintenance.</i></p>		
<p><b>Review of Preventive Maintenance:</b></p>		
<p>Authorized PerkinElmer Representative:</p> <p>Monchai Kitcharoenkeat</p>	<p><i>Monchai</i></p>	<p>Date:</p> <p>22-Feb-2025 (DD-MMM-YYYY)</p>
<p>Authorized Customer Representative:</p> <p>Ms.Naruecha</p>	<p><i>Naruecha</i></p>	<p>Date:</p> <p>22-Feb-2025 (DD-MMM-YYYY)</p>