

ภาคผนวกที่ 4

เอกสารการสอบเทียบความถูกต้องของเครื่องมือ

**ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม**

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
1. คุณภาพอากาศในบรรยากาศ Total Suspended Particulate (TSP)	High Volume Air Sampler Rec No. R07, R08, R17 B. No. R07, R08, R17	Digital Balance
Carbon Monoxide	Personal Pump SKC No. B37, B41, R06	CO Analyzer No. R02
Nitrogen Dioxide	NO ₂ Analyzer No. B17, R02, R011	NO ₂ Analyzer No. B17, R02, R011
2. คุณภาพอากาศจากปล่อง Total Suspended Particulate (TSP)	Console No. R04 Pitot Tube No. B33, B38	Digital Balance
Carbon Monoxide (CO)	Personal Pump SKC No. B40, B57, R40 Rotameter No. H-R02	CO Analyzer No. B02
Oxides of Nitrogen (NO _x)	Vacuum Gauge	Spectrophotometer
Xylene	Personal Pump SKC No. B28 Rotameter No. L-R02	GC/FID
Acetic Acid	Personal Pump SKC No. B57 Rotameter No. L-R02	GC/FID
3. คุณภาพอากาศในสถานประกอบการ Total Dust	Personal Pump No. R12, R38, R40, R44 Rotameter No. H-R02	Digital Balance
Xylene	Personal Pump SKC No. R10, R11, R14, R15, R17, R30, R31, R42, R43 Rotameter No. L-R02	GC/FID
Acetic Acid	Personal Pump SKC No. B66, R10, R11, R15, R17, R26, R30, R31, R42, R43 Rotameter No. L-R02	GC/FID
Methyl Acetate	Personal Pump SKC No. R15, R30, R42, R43 Rotameter No. L-R02	GC/FID
Methanol	Personal Pump SKC No. B62, R26 Rotameter No. L-R02	GC/FID
4. ระดับเสียง L _{eq} 24 hr, L ₉₀ , L _{eq} 8 hr	Acoustic Calibrator Integrated Sound Level Meter No. ACO-R19, R20, R21 CR-B05	-

ตารางสรุปรายการเอกสารการสอบเทียบความถูกต้องของเครื่องมือเก็บตัวอย่าง
และเครื่องมือตรวจวิเคราะห์คุณภาพสิ่งแวดล้อม (ต่อ)

รายการตรวจวัด	เครื่องมือเก็บตัวอย่าง	เครื่องมือตรวจวิเคราะห์
	ชื่อเครื่องมือ	ชื่อเครื่องมือ
5. คุณภาพน้ำทิ้ง		
pH	-	pH Meter
Temperature	-	Thermometer
Total Suspended Solids	-	Digital Balance
Total Dissolved Solids	-	Digital Balance
BOD ₅	-	BOD Analyzer
COD	-	COD Reactor
Grease & Oil	-	Digital Balance
Manganese	-	Inductively Coupled Plasma
Conductivity	-	Conductivity Meter
6. คุณภาพดิน		
Total Xylene	-	GC/MS
Total Manganese	-	Inductively Coupled Plasma
Total Cobalt	-	Inductively Coupled Plasma
Total Palladium	-	Inductively Coupled Plasma

คุณภาพอากาศในบรรยากาศ



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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

High Volume Air Sampler Calibration Report

Calibration Method : Multipoint Orifice Flow Transfer Standard

Model : TE 5025A

S/N : 3440

Calibration Data

High Volume Air Sampler Data		Calibration Data		
Recorder No.	Blower No.	Date	Actual Flowrate (ft ³ /min)	R ²
B35	B35	01/08/2025	y = 1.126x-2.314	0.997
B36	B36	01/08/2025	y = 1.158x-3.625	0.999
B37	B37	01/08/2025	y = 1.071x-0.714	0.998
B38	B38	07/08/2025	y = 1.138x-6.470	0.999
B39	B39	07/08/2025	y = 1.074x-2.233	0.999
B40	B40	01/08/2025	y = 1.137x-4.281	0.998
B41	B41	01/08/2025	y = 1.124x-3.061	0.999
B42	B42	01/08/2025	y = 1.130x-3.831	0.998
B43	B43	04/08/2025	y = 1.098x-1.647	0.999
B44	B44	07/08/2025	y = 1.107x-2.029	0.997
R01	R01	01/08/2025	y = 1.027x+1.685	0.998
R02	R02	01/08/2025	y = 1.154x-5.444	0.998
R03	R03	01/08/2025	y = 1.174x-5.934	0.999
R04	R04	04/08/2025	y = 1.125x-3.465	0.997
R05	R05	01/08/2025	y = 1.097x+0.437	0.999
R06	R06	04/08/2025	y = 1.138x-2.560	0.997
R07	R07	01/08/2025	y = 1.046x-0.699	0.999
R08	R08	01/08/2025	y = 1.109x-3.582	0.997
R09	R09	01/08/2025	y = 1.088x-1.852	0.999
R10	R10	01/08/2025	y = 1.134x-4.535	0.996
R11	R11	01/08/2025	y = 1.170x-6.929	0.998
R12	R12	01/08/2025	y = 1.151x-4.183	0.999
R13	R13	01/08/2025	y = 1.117x-4.198	0.999
R14	R14	01/08/2025	y = 1.109x-2.662	0.998
R15	R15	01/08/2025	y = 1.126x-5.806	0.996
R16	R16	01/08/2025	y = 1.149x-7.086	0.996
R17	R17	01/08/2025	y = 1.120x-5.050	0.997
R18	R18	04/08/2025	y = 1.155x-5.737	0.997
R19	R19	04/08/2025	y = 1.131x-5.715	0.997
R20	R20	01/08/2025	y = 1.152x-5.912	0.996

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 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.)			y	R ²
					1	2	3	1	2	3		
B01	SKC	224-PCXR4	262101	03/10/2025	1,000	1,500	2,000	998	1,490	1,997	1.000x - 7.191	1.000
B02	SKC	224-PCXR4	626166	03/10/2025	1,000	1,500	2,000	1,007	1,500	2,008	0.999x + 2.537	1.000
B03	SKC	224-PCXR4	612968	03/10/2025	1,000	1,500	2,000	1,003	1,503	2,001	0.997x + 0.810	0.999
B04	SKC	224-PCXR4	602804	02/10/2025	1,000	1,500	2,000	998	1,494	1,993	1.001x - 6.035	1.000
B05	SKC	224-PCXR4	612693	02/10/2025	1,000	1,500	2,000	999	1,495	2,001	0.999x - 2.481	1.000
B06	SKC	224-PCXR4	262188	02/10/2025	1,000	1,500	2,000	997	1,510	2,000	0.998x + 0.064	0.999
B07	SKC	224-PCXR4	626262	01/10/2025	1,000	1,500	2,000	1,004	1,492	2,007	1.002x - 4.778	1.000
B08	SKC	224-PCXR4	626100	02/10/2025	1,000	1,500	2,000	1,005	1,500	2,005	1.004x - 7.223	1.000
B09	SKC	224-PCXR4	626479	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,986	0.996x + 3.462	0.999
B10	SKC	224-PCXR4	091950	01/10/2025	1,000	1,500	2,000	997	1,504	2,000	1.003x - 8.822	1.000
B11	SKC	224-PCXR8	564315	03/10/2025	1,000	1,500	2,000	1,001	1,503	1,995	0.995x + 2.449	1.000
B12	SKC	224-PCXR4	034656	03/10/2025	1,000	1,500	2,000	997	1,506	2,003	1.003x - 9.062	0.999
B13	SKC	224-PCXR4	602073	03/10/2025	1,000	1,500	2,000	1,003	1,497	2,006	1.002x - 5.013	1.000
B14	SKC	224-PCXR4	626313	03/10/2025	1,000	1,500	2,000	998	1,501	1,992	1.005x - 11.702	0.999
B15	SKC	224-PCXR4	626474	03/10/2025	1,000	1,500	2,000	1,001	1,502	2,004	1.006x - 11.694	1.000
B16	SKC	224-PCXR4	626477	03/10/2025	1,000	1,500	2,000	996	1,498	1,992	1.007x - 16.329	0.999
B17	SKC	224-PCXR4	626860	02/10/2025	1,000	1,500	2,000	1,001	1,503	1,998	1.001x - 4.838	1.000
B18	SKC	224-PCXR4	691484	01/10/2025	1,000	1,500	2,000	997	1,514	1,996	0.996x + 5.360	1.000
B19	SKC	224-PCXR4	691599	01/10/2025	1,000	1,500	2,000	998	1,499	2,003	0.998x + 0.399	1.000
B20	SKC	224-PCXR4	691587	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,999	0.995x + 1.520	0.999
B21	SKC	224-PCXR4	691531	03/10/2025	1,000	1,500	2,000	996	1,502	2,001	1.003x - 7.151	1.000
B22	SKC	224-PCXR4	691654	03/10/2025	1,000	1,500	2,000	1,001	1,500	1,998	0.997x - 0.666	1.000
B23	SKC	224-PCXR4	798393	03/10/2025	1,000	1,500	2,000	993	1,507	1,999	1.007x - 17.505	0.999
B24	SKC	224-PCXR4	626363	03/10/2025	1,000	1,500	2,000	994	1,498	1,995	1.000x - 3.941	1.000
B25	SKC	224-PCXR4	798489	01/10/2025	1,000	1,500	2,000	1,003	1,490	2,001	0.997x + 1.703	1.000
B26	SKC	224-PCXR4	798479	01/10/2025	1,000	1,500	2,000	1,001	1,509	1,995	1.002x - 8.057	0.999
B27	SKC	224-PCXR4	691673	01/10/2025	1,000	1,500	2,000	998	1,510	2,002	1.005x - 9.656	1.000
B28	SKC	224-PCXR4	691570	01/10/2025	1,000	1,500	2,000	1,011	1,508	2,009	0.999x + 3.729	0.999
B29	SKC	224-PCXR4	626472	01/10/2025	1,000	1,500	2,000	1,002	1,503	1,998	1.002x - 6.066	1.000
B30	SKC	224-PCXR4	691489	01/10/2025	1,000	1,500	2,000	997	1,506	2,001	1.004x - 8.049	1.000
B31	SKC	224-PCXR4	691509	02/10/2025	1,000	1,500	2,000	995	1,497	1,992	0.998x - 2.293	1.000
B32	SKC	224-PCXR4	091567	01/10/2025	1,000	1,500	2,000	1,002	1,500	2,003	1.008x - 15.778	0.999
B33	SKC	224-PCXR4	091756	02/10/2025	1,000	1,500	2,000	1,003	1,501	1,997	1.003x - 6.509	1.000
B34	SKC	224-PCXR4	612962	01/10/2025	1,000	1,500	2,000	996	1,512	1,996	1.001x - 5.867	0.999
B35	SKC	224-PCXR4	602682	01/10/2025	1,000	1,500	2,000	1,008	1,494	1,999	0.993x + 6.992	1.000
B36	SKC	224-PCXR4	626164	01/10/2025	1,000	1,500	2,000	997	1,502	1,992	0.999x - 3.235	1.000
B37	SKC	224-PCXR4	626256	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,997	0.994x + 5.093	1.000
B38	SKC	224-PCXR4	626167	02/10/2025	1,000	1,500	2,000	998	1,513	1,995	1.000x - 5.277	0.999
B39	SKC	224-PCXR4	034637	03/10/2025	1,000	1,500	2,000	1,007	1,504	2,004	0.996x + 8.240	1.000
B40	SKC	224-PCXR4	798349	03/10/2025	1,000	1,500	2,000	998	1,510	2,002	0.998x + 3.905	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	01/10/2025	1,000	1,500	2,000	1,010	1,508	2,009	1.000x + 2.612	0.999
B42	SKC	224-PCXR4	626041	02/10/2025	1,000	1,500	2,000	1,004	1,494	1,994	0.997x + 1.344	1.000
B43	SKC	224-PCXR4	034636	01/10/2025	1,000	1,500	2,000	998	1,505	2,002	1.001x - 5.177	1.000
B44	SKC	224-PCXR8	529341	01/10/2025	1,000	1,500	2,000	999	1,496	1,998	0.996x + 0.909	1.000
B45	SKC	224-PCXR8	529594	01/10/2025	1,000	1,500	2,000	996	1,510	1,992	1.005x - 11.543	1.000
B46	SKC	224-PCXR8	566743	01/10/2025	1,000	1,500	2,000	1,003	1,488	1,997	0.994x + 3.717	1.000
B47	SKC	224-PCXR8	566747	01/10/2025	1,000	1,500	2,000	1,004	1,500	1,993	0.996x + 2.230	1.000
B48	SKC	224-PCXR8	566753	01/10/2025	1,000	1,500	2,000	1,002	1,501	1,991	1.000x - 4.116	0.999
B49	SKC	224-PCXR8	566780	01/10/2025	1,000	1,500	2,000	995	1,502	1,990	0.997x - 1.978	1.000
B50	SKC	224-PCXR8	500400	02/10/2025	1,000	1,500	2,000	997	1,503	2,001	1.004x - 10.178	1.000
B51	SKC	224-PCXR8	500363	01/10/2025	1,000	1,500	2,000	1,001	1,502	1,993	0.995x + 2.848	1.000
B52	SKC	224-PCXR8	093186	03/10/2025	1,000	1,500	2,000	996	1,510	1,999	1.005x - 12.252	0.999
B53	SKC	224-PCXR8	707670	03/10/2025	1,000	1,500	2,000	1,002	1,496	2,004	1.003x - 8.791	1.000
B54	SKC	224-PCXR3	509821	03/10/2025	1,000	1,500	2,000	999	1,501	1,995	0.999x - 2.090	1.000
B55	SKC	224-PCXR3	510710	02/10/2025	1,000	1,500	2,000	1,002	1,503	2,006	1.007x - 13.250	0.999
B56	SKC	224-PCXR3	511450	01/10/2025	1,000	1,500	2,000	995	1,505	1,997	1.002x - 7.594	1.000
B57	SKC	224-PCXR3	510798	02/10/2025	1,000	1,500	2,000	998	1,500	1,994	0.999x - 7.163	0.999
B58	SKC	224-PCXR3	509852	03/10/2025	1,000	1,500	2,000	1,002	1,494	1,996	0.993x + 6.485	1.000
B59	SKC	224-PCXR3	509862	01/10/2025	1,000	1,500	2,000	1,006	1,505	1,998	0.996x + 5.117	1.000
B60	SKC	224-PCXR3	512655	02/10/2025	1,000	1,500	2,000	1,004	1,501	2,003	1.010x - 14.223	0.999
B61	SKC	224-PCXR3	503915	03/10/2025	1,000	1,500	2,000	993	1,495	1,994	0.999x - 4.942	1.000
B62	SKC	224-PCXR3	505975	03/10/2025	1,000	1,500	2,000	995	1,500	2,005	1.009x - 16.396	1.000
B63	SKC	224-PCXR3	511432	03/10/2025	1,000	1,500	2,000	996	1,497	1,991	0.998x - 3.171	1.000
B64	SKC	224-PCXR3	508302	03/10/2025	1,000	1,500	2,000	1,008	1,506	1,998	0.992x + 8.667	0.999
B65	SKC	224-PCXR3	508310	03/10/2025	1,000	1,500	2,000	1,006	1,492	2,003	1.000x - 4.355	1.000
B66	SKC	224-PCXR3	509861	03/10/2025	1,000	1,500	2,000	994	1,496	1,994	0.997x - 0.275	1.000
B67	SKC	224-PCXR3	506295	01/10/2025	1,000	1,500	2,000	997	1,505	2,001	1.004x - 10.258	1.000
B68	SKC	224-PCXR3	505872	03/10/2025	1,000	1,500	2,000	998	1,512	1,992	0.999x - 3.554	0.999
B69	SKC	224-PCXR3	508375	01/10/2025	1,000	1,500	2,000	997	1,489	1,996	0.997x - 2.309	1.000
B70	SKC	224-PCXR3	510623	03/10/2025	1,000	1,500	2,000	1,001	1,496	1,991	0.992x + 7.131	1.000
B71	SKC	224-PCXR3	508367	03/10/2025	1,000	1,500	2,000	999	1,498	1,995	0.994x + 6.433	1.000
B72	SKC	224-PCXR3	505977	03/10/2025	1,000	1,500	2,000	996	1,507	1,999	1.003x - 7.490	1.000
B73	SKC	224-PCXR3	512606	03/10/2025	1,000	1,500	2,000	1,004	1,503	2,003	1.001x - 5.285	0.999
B74	SKC	224-PCXR3	505993	01/10/2025	1,000	1,500	2,000	1,006	1,501	1,997	0.993x + 8.232	1.000
B75	SKC	224-PCXR3	509820	02/10/2025	1,000	1,500	2,000	1,005	1,494	1,995	0.997x - 2.979	0.999
B76	SKC	224-PCXR3	509811	02/10/2025	1,000	1,500	2,000	996	1,503	1,999	1.005x - 10.613	1.000
B77	SKC	224-PCXR3	508301	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,998	0.994x + 4.694	1.000
B78	SKC	224-PCXR3	510677	01/10/2025	1,000	1,500	2,000	1,004	1,492	1,997	0.995x + 4.036	1.000
B79	SKC	224-PCXR3	510920	01/10/2025	1,000	1,500	2,000	1,008	1,504	2,006	1.006x - 9.588	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)			y	R ²
					1	2	3	1	2	3		
R01	SKC	224-PCXR4	602467	01/10/2025	1,000	1,500	2,000	1,001	1,504	2,006	1.001x + 1.123	1.000
R02	SKC	224-PCXR4	626450	01/10/2025	1,000	2,000	3,000	997	1,511	1,997	1.000x - 2.215	1.000
R03	SKC	224-PCXR4	691592	01/10/2025	1,000	1,500	2,000	1,004	1,504	2,008	1.005x - 5.705	1.000
R04	SKC	224-PCXR4	691672	01/10/2025	1,000	1,500	2,000	1,013	1,505	2,007	0.996x + 7.748	0.999
R05	SKC	224-PCXR4	798470	01/10/2025	1,000	1,500	2,000	1,005	1,506	2,010	1.007x - 4.757	1.000
R06	SKC	224-PCXR4	798456	01/10/2025	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000
R07	SKC	224-PCXR4	798480	03/10/2025	1,000	1,500	2,000	997	1,502	1,996	1.000x - 8.975	0.999
R08	SKC	224-PCXR4	883215	03/10/2025	1,000	1,500	2,000	1,005	1,504	1,995	0.999x - 0.068	1.000
R09	SKC	224-PCXR4	034650	03/10/2025	1,000	1,500	2,000	994	1,505	1,998	1.005x - 11.989	1.000
R10	SKC	224-PCXR4	091765	01/10/2025	1,000	1,500	2,000	1,005	1,508	2,006	1.008x - 11.738	0.999
R11	SKC	224-PCXR4	091763	01/10/2025	1,000	1,500	2,000	1,006	1,493	2,003	0.996x + 5.589	1.000
R12	SKC	224-PCXR4	091568	02/10/2025	1,000	1,500	2,000	995	1,496	1,999	1.002x - 5.717	1.000
R13	SKC	224-PCXR4	091638	01/10/2025	1,000	1,500	2,000	1,012	1,505	2,008	1.004x - 2.938	0.999
R14	SKC	224-PCXR4	091764	01/10/2025	1,000	1,500	2,000	996	1,494	2,004	1.008x - 18.690	1.000
R15	SKC	224-PCXR8	529457	01/10/2025	1,000	1,500	2,000	998	1,507	2,007	1.007x - 12.957	0.999
R16	SKC	224-PCXR8	529643	01/10/2025	1,000	1,500	2,000	997	1,496	1,994	0.999x - 1.395	1.000
R17	SKC	224-PCXR8	529645	01/10/2025	1,000	1,500	2,000	1,005	1,503	1,995	1.005x - 10.886	0.999
R18	SKC	224-PCXR8	566756	01/10/2025	1,000	1,500	2,000	997	1,505	1,993	1.000x - 4.450	1.000
R19	SKC	224-PCXR8	566802	01/10/2025	1,000	1,500	2,000	1,004	1,504	2,007	1.006x - 6.752	1.000
R20	SKC	224-PCXR8	529089	03/10/2025	1,000	1,500	2,000	1,008	1,497	2,001	1.002x - 6.225	0.999
R21	SKC	224-PCXR8	665728	03/10/2025	1,000	1,500	2,000	997	1,505	2,003	1.006x - 16.975	0.999
R22	SKC	224-PCXR8	707444	01/10/2025	1,000	1,500	2,000	1,005	1,494	2,001	0.995x + 6.369	1.000
R23	SKC	224-PCXR8	761067	01/10/2025	1,000	1,500	2,000	1,008	1,495	2,000	0.992x + 13.025	1.000
R24	SKC	224-PCXR8	707893	01/10/2025	1,000	1,500	2,000	1,005	1,504	1,997	1.004x - 8.140	0.999
R25	SKC	224-PCXR8	761052	01/10/2025	1,000	1,500	2,000	1,006	1,510	2,006	1.001x - 0.152	0.999
R26	SKC	224-PCXR8	707956	01/10/2025	1,000	1,500	2,000	1,000	1,513	2,008	1.008x - 10.714	1.000
R27	SKC	224-PCXR8	707398	02/10/2025	1,000	1,500	2,000	1,011	1,512	2,012	1.002x + 2.547	0.999
R28	SKC	224-PCXR8	707481	02/10/2025	1,000	1,500	2,000	999	1,498	2,000	1.000x + 0.144	1.000
R29	SKC	224-PCXR8	707402	02/10/2025	1,000	1,500	2,000	1,000	1,509	2,006	1.004x - 5.501	1.000
R30	SKC	224-PCXR8	093811	02/10/2025	1,000	1,500	2,000	998	1,514	2,005	1.009x - 10.222	1.000
R31	SKC	224-PCXR8	093183	01/10/2025	1,000	1,500	2,000	999	1,508	2,003	1.005x - 9.587	1.000
R32	SKC	224-PCXR8	671950	01/10/2025	1,000	1,500	2,000	1,000	1,494	1,996	0.994x + 5.137	1.000
R33	SKC	224-PCXR4	626254	01/10/2025	1,000	1,500	2,000	1,004	1,493	2,005	1.008x - 16.151	0.999
R34	SKC	224-PCXR4	626131	01/10/2025	1,000	1,500	2,000	998	1,508	1,994	0.998x - 0.764	1.000
R35	SKC	224-PCXR8	707460	01/10/2025	1,000	1,500	2,000	1,003	1,502	1,993	0.993x + 8.172	1.000
R36	SKC	224-PCXR8	707446	01/10/2025	1,000	1,500	2,000	997	1,510	1,999	1.004x - 8.044	1.000
R37	SKC	224-PCXR8	707432	01/10/2025	1,000	1,500	2,000	1,012	1,515	2,007	0.997x + 7.376	0.999
R38	SKC	224-PCXR8	707349	03/10/2025	1,000	1,500	2,000	999	1,511	1,998	1.001x - 2.918	1.000
R39	SKC	224-PCXR8	761095	03/10/2025	1,000	1,500	2,000	1,008	1,514	1,996	0.993x + 11.058	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2025	BRAND :	API	MODEL :	200A
NO.	NOX-B17	SERIAL NO.	1977		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 01 September 2025			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: 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	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.7	-0.075	400.0	1.004
NO _x Span	400	400.1	0.025	400.0	1.007
API Model 200A NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	507	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.5	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	673	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	29.2	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	315.2	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.5	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.004	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	0.7	mV	-20 to +150		
NO _x Offset	0.3	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by :

(Mr.Kaseam Simaphon)


Approved by :

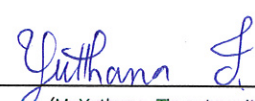
(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R02	SERIAL NO.	2285		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 01 September 2025			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: A00726SV
Certified Date	: 05 January 2023		Expired Date	: 05 January 2026	
				Cylinder Conc.	: 48.8 ppm
CALIBRATING CONDITION					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	49	
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.005
NO _x Span	400	400.3	0.075	400.0	1.007
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	509	cc/min	500 ± 50		
OZONE FLOW	78	cc/min	80 ± 15		
PMT	103.8	mV	-20 - 150		
AZERO	94.2	mV	-20 - 150		
HVPS	669	V	420 - 900 constant		
RCELL TEMP	50.0	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.0	°C	7 ± 2		
MOLY TEMP	315.3	°C	315 ± 5		
RCELL PRESS	8.3	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.005	-	1.0 ± 0.3		
NO _x Slope	1.007	-	1.0 ± 0.3		
NO Offset	0.9	mV	-20 to +150		
NO _x Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		


Calibrated by : 
(Mr.Kaseam Simaphon)

Approved by : 
(Mr.Yuthana Thanataranit)



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CALIBRATION REPORT					
CHEMILUMINESCENT NO / NO ₂ / NO _x ANALYZER					
DATE :	23 October 2025	BRAND :	API	MODEL :	200E
NO.	NOX-R11	SERIAL NO.	2621		
Calibrator (Dilution System)					
Brand	: API			Model	: 700
Last Cal. Date	: 01 September 2025			Serial No.	: 911
Reference Standard Gas					
Standard Gas	: Nitric Oxide (NO)			Cylinder No.	: 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	49				
CALIBRATION SETTING					
Span	Initial Reading (Before Adj.),PPB			Final Reading (After Adj.),PPB	
Set Point	Expected Concentration	Analyzer Response	%Dif	Analyzer Response	Slope
Zero	0	-0.10	-	0	-
NO Span	400	399.9	-0.025	400.0	1.001
NO _x Span	400	400.2	0.050	400.0	1.004
API Model 200E NO _x Analyzer Check List					
Test Values	Observed Value	Units	Nominal Range		
RANGE	500	PPB	500 standard		
STABILITY (Zero Gas)	0.1	PPB	< 2 with zero air		
SAMPLE FLOW	506	cc/min	500 ± 50		
OZONE FLOW	79	cc/min	80 ± 15		
PMT	103.2	mV	-20 - 150		
AZERO	94.1	mV	-20 - 150		
HVPS	671	V	420 - 900 constant		
RCELL TEMP	50.2	°C	50 ± 1		
BOX TEMP	28.9	°C	8 - 48		
PMT TEMP	7.1	°C	7 ± 2		
MOLY TEMP	314.9	°C	315 ± 5		
RCELL PRESS	8.4	IN-Hg-A	2 - 10 constant		
SAMPLE PRESS	28.4	IN-Hg-A	25 - 30 constant		
NO Span Conc	400	PPB	20 - 20,000		
NO _x Span Conc	400	PPB	20 - 20,000		
NO Slope	1.001	-	1.0 ± 0.3		
NO _x Slope	1.004	-	1.0 ± 0.3		
NO Offset	0.9	mV	-20 to +150		
NO _x Offset	0.5	mV	-20 to 150		
Stability at Zero	0.1	PPB	< 0.2		
Stability at Span	0.2	PPB	< 2 ppb @ 400 ppb span gas		

Calibrated by : 
(Mr.Kaseam Simaphon)

Approved by : 
(Mr.Yuthana Thanataranit)



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 : 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





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Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	23 October 2025	Brand :	API	Model :	300E
No.	CO-R02			Serial No.	171-S
Calibrator (Dilution System)					
Brand : API			Model : 700		
Last Cal. Date : 01 September 2025			Serial No. : 911		
Reference Standard Gas					
Standard Gas : Carbon Monoxide (CO)			Cylinder No. : D711839		
Certified Date : 14 March 2024		Expired Date : 14 March 2032		Cylinder Conc. : 4,580 ppm	
Calibrating Condition					
Pressure	1011	mmbar	Temp.	24.5	°C
			% RH	48	
Calibration Setting					
Span	Initial Reading (Before Adj.), PPM			Final Reading (After Adj.), PPM	
Set Point	Expected Concentration	Analyzer Response		%Dif	
Zero	0	-0.10		-	
CO Span	40.00	40.05		0.125	
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	4016.2	mV	2500-4800 mV		
CO Reference	3948.8	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.5	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	808	CC/Min	800 ± 10%		
Sample Temperature	48.4	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3045.7	mV	250 mV to 4750 mV		
Slope	1.017	-	1.0 ± 0.3		
Offset	0.2	-	0 ± 0.3		

Calibrated by :

(Mr.Kaseam Simaphon)

Approved by :

(Mr.Yuthana Thanataranit)

คุณภาพอากาศจากปล่อง



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Console Calibration Report

Calibration Method

Critical Orifices

Calibration Data

Console Data		Calibration Data		
No.	Serial No.	Date	y	ΔH_{\oplus} (mmH ₂ O)
B01	1563	05/09/2025	1.004	49.67
B02	8002514	01/09/2025	1.002	49.85
B03	1503016	01/09/2025	1.005	49.77
B04	00006659	04/09/2025	0.997	49.93
B05	00007428	02/09/2025	1.003	49.51
R01	1561	01/09/2025	0.999	49.82
R02	8002513	01/09/2025	0.996	49.94
R03	1570	04/09/2025	0.998	50.02
R04	8002519	04/09/2025	1.002	49.89
R05	1503015	02/09/2025	0.996	50.10

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

Accept Value of ΔH_{\oplus} (test) is 46.7 ± 6.4 (mmH₂O)

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	04/08/2025	0.84	0.84
B04	S	0.99	01/08/2025	0.84	0.83
B05	S	0.99	01/08/2025	0.84	0.84
B07	S	0.99	04/08/2025	0.85	0.84
B08	S	0.99	01/08/2025	0.84	0.84
B09	S	0.99	04/08/2025	0.84	0.83
B11	S	0.99	05/08/2025	0.84	0.84
B16	S	0.99	04/08/2025	0.84	0.83
B18	S	0.99	01/08/2025	0.84	0.84
B19	S	0.99	01/08/2025	0.84	0.83
B21	S	0.99	04/08/2025	0.84	0.83
B24	S	0.99	01/08/2025	0.84	0.84
B27	S	0.99	04/08/2025	0.84	0.83
B30	S	0.99	01/08/2025	0.85	0.84
B31	S	0.99	01/08/2025	0.84	0.85
B33	S	0.99	01/08/2025	0.83	0.84
B35	S	0.99	01/08/2025	0.84	0.85

Remark : Accept value of Cp (test) is 0.84 ± 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	01/08/2025	0.84	0.84
B37	S	0.99	01/08/2025	0.84	0.85
B38	S	0.99	01/08/2025	0.84	0.83
B39	S	0.99	01/08/2025	0.84	0.84
B40	S	0.99	04/08/2025	0.85	0.84
B41	S	0.99	01/08/2025	0.84	0.84
B44	S	0.99	05/08/2025	0.83	0.84
B45	S	0.99	01/08/2025	0.84	0.85
B46	S	0.99	01/08/2025	0.85	0.84
B47	S	0.99	01/08/2025	0.85	0.84
B48	S	0.99	01/08/2025	0.84	0.84
B49	S	0.99	04/08/2025	0.85	0.84
B54	S	0.99	01/08/2025	0.84	0.84
B56	S	0.99	04/08/2025	0.84	0.84
B57	S	0.99	04/08/2025	0.85	0.84
B58	S	0.99	04/08/2025	0.84	0.84

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

Calibrated by :

Adul Dangklom

(Mr. Adul Dangklom)

Approved by :

Peera Detudom

(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 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.)			y	R ²
					1	2	3	1	2	3		
B01	SKC	224-PCXR4	262101	03/10/2025	1,000	1,500	2,000	998	1,490	1,997	1.000x - 7.191	1.000
B02	SKC	224-PCXR4	626166	03/10/2025	1,000	1,500	2,000	1,007	1,500	2,008	0.999x + 2.537	1.000
B03	SKC	224-PCXR4	612968	03/10/2025	1,000	1,500	2,000	1,003	1,503	2,001	0.997x + 0.810	0.999
B04	SKC	224-PCXR4	602804	02/10/2025	1,000	1,500	2,000	998	1,494	1,993	1.001x - 6.035	1.000
B05	SKC	224-PCXR4	612693	02/10/2025	1,000	1,500	2,000	999	1,495	2,001	0.999x - 2.481	1.000
B06	SKC	224-PCXR4	262188	02/10/2025	1,000	1,500	2,000	997	1,510	2,000	0.998x + 0.064	0.999
B07	SKC	224-PCXR4	626262	01/10/2025	1,000	1,500	2,000	1,004	1,492	2,007	1.002x - 4.778	1.000
B08	SKC	224-PCXR4	626100	02/10/2025	1,000	1,500	2,000	1,005	1,500	2,005	1.004x - 7.223	1.000
B09	SKC	224-PCXR4	626479	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,986	0.996x + 3.462	0.999
B10	SKC	224-PCXR4	091950	01/10/2025	1,000	1,500	2,000	997	1,504	2,000	1.003x - 8.822	1.000
B11	SKC	224-PCXR8	564315	03/10/2025	1,000	1,500	2,000	1,001	1,503	1,995	0.995x + 2.449	1.000
B12	SKC	224-PCXR4	034656	03/10/2025	1,000	1,500	2,000	997	1,506	2,003	1.003x - 9.062	0.999
B13	SKC	224-PCXR4	602073	03/10/2025	1,000	1,500	2,000	1,003	1,497	2,006	1.002x - 5.013	1.000
B14	SKC	224-PCXR4	626313	03/10/2025	1,000	1,500	2,000	998	1,501	1,992	1.005x - 11.702	0.999
B15	SKC	224-PCXR4	626474	03/10/2025	1,000	1,500	2,000	1,001	1,502	2,004	1.006x - 11.694	1.000
B16	SKC	224-PCXR4	626477	03/10/2025	1,000	1,500	2,000	996	1,498	1,992	1.007x - 16.329	0.999
B17	SKC	224-PCXR4	626860	02/10/2025	1,000	1,500	2,000	1,001	1,503	1,998	1.001x - 4.838	1.000
B18	SKC	224-PCXR4	691484	01/10/2025	1,000	1,500	2,000	997	1,514	1,996	0.996x + 5.360	1.000
B19	SKC	224-PCXR4	691599	01/10/2025	1,000	1,500	2,000	998	1,499	2,003	0.998x + 0.399	1.000
B20	SKC	224-PCXR4	691587	01/10/2025	1,000	1,500	2,000	1,001	1,501	1,999	0.995x + 1.520	0.999
B21	SKC	224-PCXR4	691531	03/10/2025	1,000	1,500	2,000	996	1,502	2,001	1.003x - 7.151	1.000
B22	SKC	224-PCXR4	691654	03/10/2025	1,000	1,500	2,000	1,001	1,500	1,998	0.997x - 0.666	1.000
B23	SKC	224-PCXR4	798393	03/10/2025	1,000	1,500	2,000	993	1,507	1,999	1.007x - 17.505	0.999
B24	SKC	224-PCXR4	626363	03/10/2025	1,000	1,500	2,000	994	1,498	1,995	1.000x - 3.941	1.000
B25	SKC	224-PCXR4	798489	01/10/2025	1,000	1,500	2,000	1,003	1,490	2,001	0.997x + 1.703	1.000
B26	SKC	224-PCXR4	798479	01/10/2025	1,000	1,500	2,000	1,001	1,509	1,995	1.002x - 8.057	0.999
B27	SKC	224-PCXR4	691673	01/10/2025	1,000	1,500	2,000	998	1,510	2,002	1.005x - 9.656	1.000
B28	SKC	224-PCXR4	691570	01/10/2025	1,000	1,500	2,000	1,011	1,508	2,009	0.999x + 3.729	0.999
B29	SKC	224-PCXR4	626472	01/10/2025	1,000	1,500	2,000	1,002	1,503	1,998	1.002x - 6.066	1.000
B30	SKC	224-PCXR4	691489	01/10/2025	1,000	1,500	2,000	997	1,506	2,001	1.004x - 8.049	1.000
B31	SKC	224-PCXR4	691509	02/10/2025	1,000	1,500	2,000	995	1,497	1,992	0.998x - 2.293	1.000
B32	SKC	224-PCXR4	091567	01/10/2025	1,000	1,500	2,000	1,002	1,500	2,003	1.008x - 15.778	0.999
B33	SKC	224-PCXR4	091756	02/10/2025	1,000	1,500	2,000	1,003	1,501	1,997	1.003x - 6.509	1.000
B34	SKC	224-PCXR4	612962	01/10/2025	1,000	1,500	2,000	996	1,512	1,996	1.001x - 5.867	0.999
B35	SKC	224-PCXR4	602682	01/10/2025	1,000	1,500	2,000	1,008	1,494	1,999	0.993x + 6.992	1.000
B36	SKC	224-PCXR4	626164	01/10/2025	1,000	1,500	2,000	997	1,502	1,992	0.999x - 3.235	1.000
B37	SKC	224-PCXR4	626256	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,997	0.994x + 5.093	1.000
B38	SKC	224-PCXR4	626167	02/10/2025	1,000	1,500	2,000	998	1,513	1,995	1.000x - 5.277	0.999
B39	SKC	224-PCXR4	034637	03/10/2025	1,000	1,500	2,000	1,007	1,504	2,004	0.996x + 8.240	1.000
B40	SKC	224-PCXR4	798349	03/10/2025	1,000	1,500	2,000	998	1,510	2,002	0.998x + 3.905	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	01/10/2025	1,000	1,500	2,000	1,010	1,508	2,009	1.000x + 2.612	0.999
B42	SKC	224-PCXR4	626041	02/10/2025	1,000	1,500	2,000	1,004	1,494	1,994	0.997x + 1.344	1.000
B43	SKC	224-PCXR4	034636	01/10/2025	1,000	1,500	2,000	998	1,505	2,002	1.001x - 5.177	1.000
B44	SKC	224-PCXR8	529341	01/10/2025	1,000	1,500	2,000	999	1,496	1,998	0.996x + 0.909	1.000
B45	SKC	224-PCXR8	529594	01/10/2025	1,000	1,500	2,000	996	1,510	1,992	1.005x - 11.543	1.000
B46	SKC	224-PCXR8	566743	01/10/2025	1,000	1,500	2,000	1,003	1,488	1,997	0.994x + 3.717	1.000
B47	SKC	224-PCXR8	566747	01/10/2025	1,000	1,500	2,000	1,004	1,500	1,993	0.996x + 2.230	1.000
B48	SKC	224-PCXR8	566753	01/10/2025	1,000	1,500	2,000	1,002	1,501	1,991	1.000x - 4.116	0.999
B49	SKC	224-PCXR8	566780	01/10/2025	1,000	1,500	2,000	995	1,502	1,990	0.997x - 1.978	1.000
B50	SKC	224-PCXR8	500400	02/10/2025	1,000	1,500	2,000	997	1,503	2,001	1.004x - 10.178	1.000
B51	SKC	224-PCXR8	500363	01/10/2025	1,000	1,500	2,000	1,001	1,502	1,993	0.995x + 2.848	1.000
B52	SKC	224-PCXR8	093186	03/10/2025	1,000	1,500	2,000	996	1,510	1,999	1.005x - 12.252	0.999
B53	SKC	224-PCXR8	707670	03/10/2025	1,000	1,500	2,000	1,002	1,496	2,004	1.003x - 8.791	1.000
B54	SKC	224-PCXR3	509821	03/10/2025	1,000	1,500	2,000	999	1,501	1,995	0.999x - 2.090	1.000
B55	SKC	224-PCXR3	510710	02/10/2025	1,000	1,500	2,000	1,002	1,503	2,006	1.007x - 13.250	0.999
B56	SKC	224-PCXR3	511450	01/10/2025	1,000	1,500	2,000	995	1,505	1,997	1.002x - 7.594	1.000
B57	SKC	224-PCXR3	510798	02/10/2025	1,000	1,500	2,000	998	1,500	1,994	0.999x - 7.163	0.999
B58	SKC	224-PCXR3	509852	03/10/2025	1,000	1,500	2,000	1,002	1,494	1,996	0.993x + 6.485	1.000
B59	SKC	224-PCXR3	509862	01/10/2025	1,000	1,500	2,000	1,006	1,505	1,998	0.996x + 5.117	1.000
B60	SKC	224-PCXR3	512655	02/10/2025	1,000	1,500	2,000	1,004	1,501	2,003	1.010x - 14.223	0.999
B61	SKC	224-PCXR3	503915	03/10/2025	1,000	1,500	2,000	993	1,495	1,994	0.999x - 4.942	1.000
B62	SKC	224-PCXR3	505975	03/10/2025	1,000	1,500	2,000	995	1,500	2,005	1.009x - 16.396	1.000
B63	SKC	224-PCXR3	511432	03/10/2025	1,000	1,500	2,000	996	1,497	1,991	0.998x - 3.171	1.000
B64	SKC	224-PCXR3	508302	03/10/2025	1,000	1,500	2,000	1,008	1,506	1,998	0.992x + 8.667	0.999
B65	SKC	224-PCXR3	508310	03/10/2025	1,000	1,500	2,000	1,006	1,492	2,003	1.000x - 4.355	1.000
B66	SKC	224-PCXR3	509861	03/10/2025	1,000	1,500	2,000	994	1,496	1,994	0.997x - 0.275	1.000
B67	SKC	224-PCXR3	506295	01/10/2025	1,000	1,500	2,000	997	1,505	2,001	1.004x - 10.258	1.000
B68	SKC	224-PCXR3	505872	03/10/2025	1,000	1,500	2,000	998	1,512	1,992	0.999x - 3.554	0.999
B69	SKC	224-PCXR3	508375	01/10/2025	1,000	1,500	2,000	997	1,489	1,996	0.997x - 2.309	1.000
B70	SKC	224-PCXR3	510623	03/10/2025	1,000	1,500	2,000	1,001	1,496	1,991	0.992x + 7.131	1.000
B71	SKC	224-PCXR3	508367	03/10/2025	1,000	1,500	2,000	999	1,498	1,995	0.994x + 6.433	1.000
B72	SKC	224-PCXR3	505977	03/10/2025	1,000	1,500	2,000	996	1,507	1,999	1.003x - 7.490	1.000
B73	SKC	224-PCXR3	512606	03/10/2025	1,000	1,500	2,000	1,004	1,503	2,003	1.001x - 5.285	0.999
B74	SKC	224-PCXR3	505993	01/10/2025	1,000	1,500	2,000	1,006	1,501	1,997	0.993x + 8.232	1.000
B75	SKC	224-PCXR3	509820	02/10/2025	1,000	1,500	2,000	1,005	1,494	1,995	0.997x - 2.979	0.999
B76	SKC	224-PCXR3	509811	02/10/2025	1,000	1,500	2,000	996	1,503	1,999	1.005x - 10.613	1.000
B77	SKC	224-PCXR3	508301	01/10/2025	1,000	1,500	2,000	1,003	1,490	1,998	0.994x + 4.694	1.000
B78	SKC	224-PCXR3	510677	01/10/2025	1,000	1,500	2,000	1,004	1,492	1,997	0.995x + 4.036	1.000
B79	SKC	224-PCXR3	510920	01/10/2025	1,000	1,500	2,000	1,008	1,504	2,006	1.006x - 9.588	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	03/10/2025	1,000	1,500	2,000	1,005	1,504	2,007	1.003x - 2.699	1.000
R41	SKC	224-PCXR4	626140	03/10/2025	1,000	1,500	2,000	998	1,498	2,000	1.001x - 1.631	1.000
R42	SKC	224-PCXR4	626463	03/10/2025	1,000	1,500	2,000	1,004	1,496	1,999	0.993x + 9.615	1.000
R43	SKC	224-PCXR4	626129	03/10/2025	1,000	1,500	2,000	1,002	1,505	2,003	1.008x - 13.761	0.999
R44	SKC	224-PCXR4	602753	01/10/2025	1,000	1,500	2,000	1,004	1,503	1,999	1.006x - 9.411	0.999
R45	SKC	224-PCXR4	626137	01/10/2025	1,000	1,500	2,000	997	1,504	1,998	1.002x - 3.862	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

Calibration Data											
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-R01	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	501.1	997.7	1996.7	1.000x - 2.348	0.999
H-R02	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.3	999.2	1997.5	1.001x - 2.181	1.000
H-R03	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	500.9	1001.1	1999.3	0.999x + 0.708	0.999
H-R04	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	501.4	999.4	1998.9	0.997x + 3.139	1.000
H-R05	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.5	1000.7	1998.2	0.998x + 2.480	1.000
H-R06	Dwyer	VFB-65	03/10/2025	500	1,000	2,000	502.0	998.5	1994.8	1.000x - 1.968	0.999

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 Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

Calibration Data											
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
L-R01	Dwyer	VFA-21	01/10/2025	50	100	200	50.3	101.0	200.7	0.997x + 0.613	1.000
L-R02	Dwyer	VFA-21	01/10/2025	50	100	200	50.1	101.2	200.1	1.001x - 0.303	0.999
L-R03	Dwyer	VFA-21	02/10/2025	50	100	200	49.7	99.8	199.9	1.002x - 0.371	1.000
L-R04	Dwyer	VFA-21	02/10/2025	50	100	200	50.2	100.9	200.6	1.000x - 0.110	0.999
L-R05	Dwyer	VFA-21	01/10/2025	50	100	200	50.7	100.8	200.3	0.999x + 0.555	1.000
L-R06	Dwyer	VFA-21	03/10/2025	50	100	200	50.5	99.7	201.1	0.998x + 0.476	1.000

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

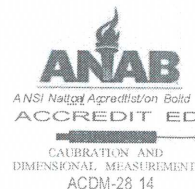
Approved by :

(Mr. Peera Detudom)



CALIBRATION LABORATORY Co.,LTD.

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



CERTIFICATE OF CALIBRATION FOR

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

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

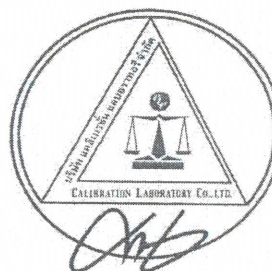
DATE OF RECEIVED : 19 July 2025

DATE OF ISSUED: 24 July 2025

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

Calibrated By : Sittipong Pimdee
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
24 July 2025

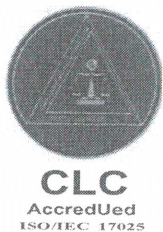


This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24076549

F3-011-05/12-23

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

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



CALIBRATION AND
DIMENSIONAL MEASUREMENT
ACDM-2814

REPORT OF CALIBRATION

FOR

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

ENVIRONMENT CONDITIONS

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

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

PROCEDURE USED :

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

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

REFERENCE STANDARD USED :

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

TRACEABILITY :

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

UNCERTAINTY :

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

Certificate No. Q24076549

F3-011-05/12-23

page 2 of 3

CONDITION OF CALIBRATION ITEM :RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS: (X) without adjustment () adjustment

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

CALIBRATION DATA

CORRECTION OF PRESSURE

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

Uncertainty of measurement ± 0.2 inHg

Transmitting fluid : Air.

Technical Note. Conversion factor 1 kPa ; 0.2953003 inHg

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

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

End of Certificate

Certificate No. Q24076549

F3-011-05/ 12-23



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.





QUALITY CALIBRATION CO.,LTD.

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

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

www.qcalibration.com

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 :-

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

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

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

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

- NATIONAL INSTITUTE OF METROLOGY (THAILAND)

RESULT OF CALIBRATION :- WITHOUT ADJUSTMENT

1. ZERO SETTING FUNCTION : NORMAL

2. TARE FUNCTION : NORMAL

3. REPEATABILITY OF READING AT 120 g WAS 0.000055 g

4. DEPARTURE FROM NOMINAL VALUE/ LINEARITY

NOMINAL VALUE (g)	BALANCE READING (g)	CORRECTION (g)	UNCERTAINTY (\pm g)
0.00	0.00000	0.00000	0.000065
0.02	0.01999	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

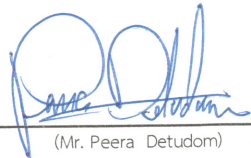




บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด
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7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900
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Tel : (662) 939-4370-72. Fax : (662) 513-4221, E-mail : sale@spscon.com., www.spscon.com

Calibration Report					
Non-Dispersive Infrared CO Analyzer					
Date :	01 October 2025	Brand :	API	Model :	300E
No.	CO-B02			Serial No.	965
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	40.03	0.075	40.00	
API Model 300E CO Analyzer Check List					
Parameter	Observed Value	Units	Nominal Range		
Range	50	PPM	0-1000 ppm		
Stability	0.10	PPM	< 1 ppm With Zero Air		
CO Measure	4015.7	mV	2500-4800 mV		
CO Reference	3947.9	mV	2500-4800 mV		
Measure/Reference Ratio	1.180	-	1.1-1.3 W/Zero Air		
Sample Pressure	28.6	In-Hg-A	~2" < Ambient Absolute Pressure		
Sample Flow	808	CC/Min	800 ± 10%		
Sample Temperature	48.5	°C	48 ± 4		
Bench Temperature	48.2	°C	48 ± 2		
Wheel Temperature	68.3	°C	68 ± 2		
Box Temperature	30.8	°C	Ambient Temp + 7 ± 10		
Photo-Drive	3037.5	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 : 
(Mr. Peera Detudom)

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. : SP25026

Pages : 1 of 4

Calibration Certificate

Equipment : UV-VIS SPECTROPHOTOMETER
Manufacturer : PERKINELMER
Model : LAMBDA 25
Serial No.: 501S14123010
ID No.: SP03/58
Calibration Mode : WAVELENGTH ACCURACY
PHOTOMETRIC ACCURACY
STRAY LIGHT

Condition As Found : GOOD

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

Location : ORGANIC LABORATORY IV

Ambient Temperature : (22.9 \pm 5) °C
Relative Humidity : (53.7 \pm 25) %

Received Date : 22 AUGUST 2025
Calibration Date : 22 AUGUST 2025
Date of Issue : 25 AUGUST 2025

Calibrated by :

Nitinun Srihawan

Approved by :

Wichok B.
(Wichok Ekpongpradit)

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

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 2 of 4

Calibration Method :

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

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

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

Condition of this result of calibration :

1. Certified reference materials

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

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

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

3.1 The UK National Physical Laboratory (NPL)

Result of calibration : Wavelength Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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

Result of calibration : Photometric Accuracy

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

UUC* = Unit Under Calibration

Cert. No. : SP25026

Job No. : VC68SP0019

Pages : 4 of 4

Result of calibration : Photometric Accuracy

(Without adjustment)

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

UUC* = Unit Under Calibration

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

Resolution of Wavelength Mode 0.1 nm

Resolution of Photometric Mode 0.001 A

Parameter Setting

Measurement Mode Wavelength, Absorbance

Wavelength Scan 190 nm - 1100 nm

Scanning Speed 7.5 nm/min

Band width(Wavelength) 1.0

Band width(Vis) 1.0

Band width(Uv) 1.0

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

**Specific Acceptance :

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

**Stray light not TISI Accredited

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

End of Calibration Certificate



บริษัท 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

GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0825/23032

Instrument Type : Gas Chromatography

Model : 3800

Serial Number : 00734

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

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

Date : 02/08/2025

ELECTRONIC TEST

CPU	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
DISPLAY & LED 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 Detectors (FID Channel-Front)

INJECTOR : 1079 Injector

GC CONDITION:

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

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

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

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



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THAI UNIQUE CO., LTD.

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Detector Sensitivity (FID)

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

Temperature Specification

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

Relative Standard Deviation % (%RSD)

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

APPROVAL :

Signature:

Engineer : Somchai Pohtongkam

Date : 02/08/2025



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THAI UNIQUE CO., LTD.

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

Results Integrated System Testing

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

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

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

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

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	<i>Sachin P.</i>	
Date	02/08/2025	



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



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THAI UNIQUE CO., LTD.

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

Results Integrated System Testing

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

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

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

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

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	<i>Sanchul P.</i>	
Date	02/08/2025	



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



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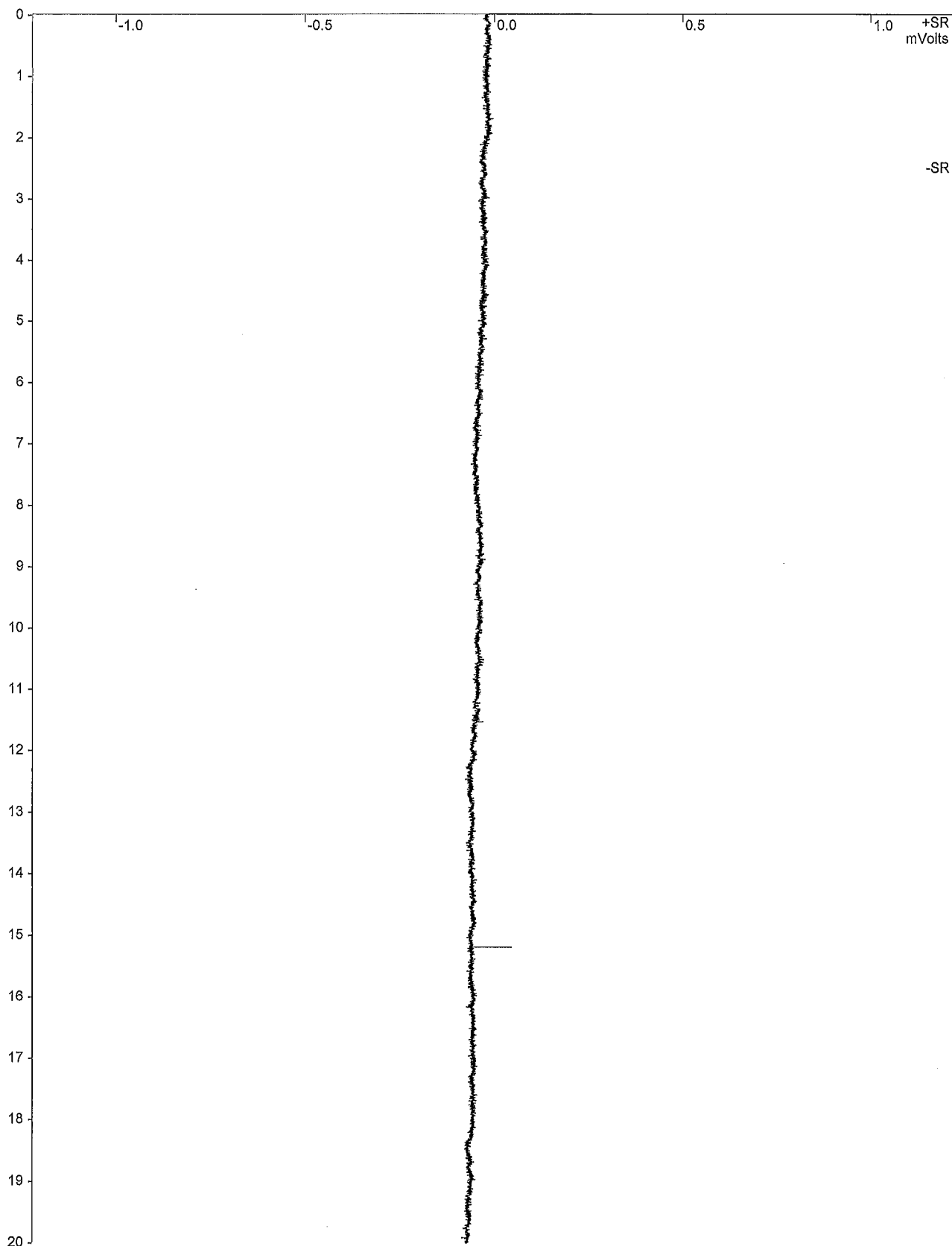
Title :
Run File : e:\sps2025\blk001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : blk

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

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

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

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



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

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

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

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

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

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

Total Unidentified Counts : 0 counts

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

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: -14 microVolts LSB: 1 microVolts

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

Manual injection

Data Handling: No peaks

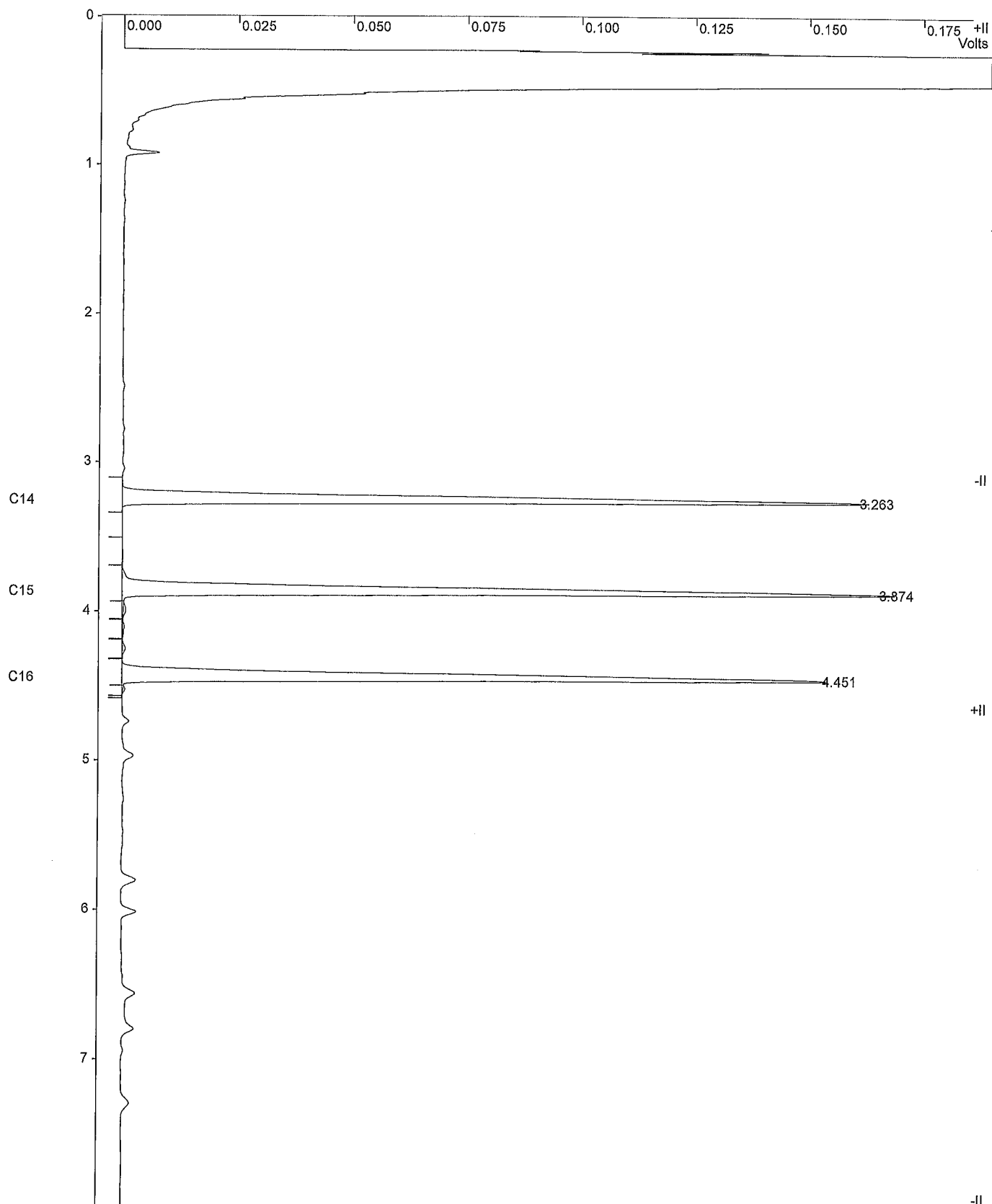
Title :
Run File : e:\sps2025\fidstd001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : fidstd

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

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

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

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



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

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

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

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

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

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

Total Unidentified Counts : 0 counts

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

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

Baseline Offset: 6 microVolts LSB: 1 microVolts

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

Manual injection

Sample ID: **fid std**

Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):



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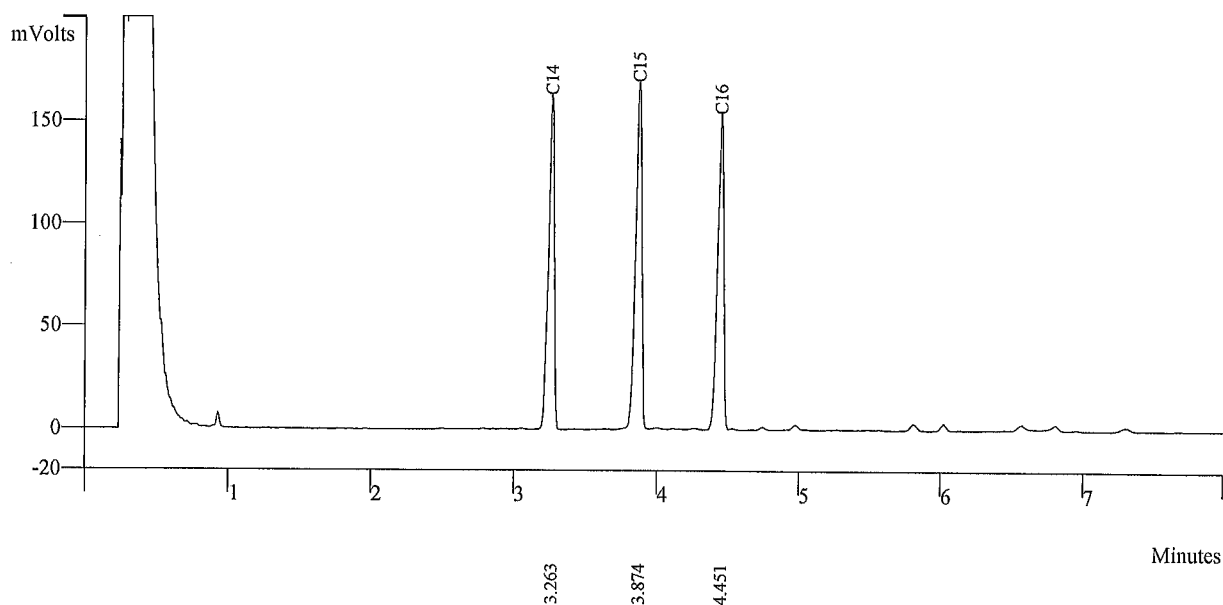
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd001.run

A = FID 10 V RESULTS



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

Sample ID: fid std



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Operator (Inj): watsamon

Injection Date: 02/08/2025

Calc Date: 02/08/2025

Run Time (min): 7.993

Workstation: GC-LAB

Instrument (Inj):

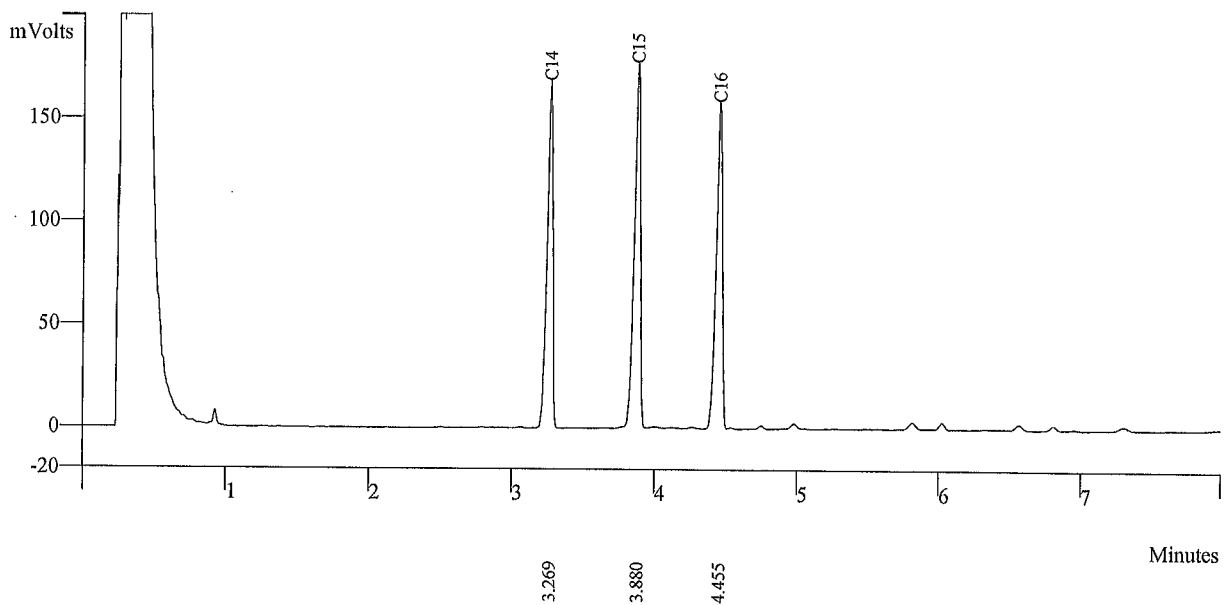
Run Mode: Calibration

Peak Measurement: Peak Area

Calculation Type: External Std.

e:\sps2025\fidstd002.run

A = FID 10 V RESULTS



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



Sample ID: **fid std**

Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):



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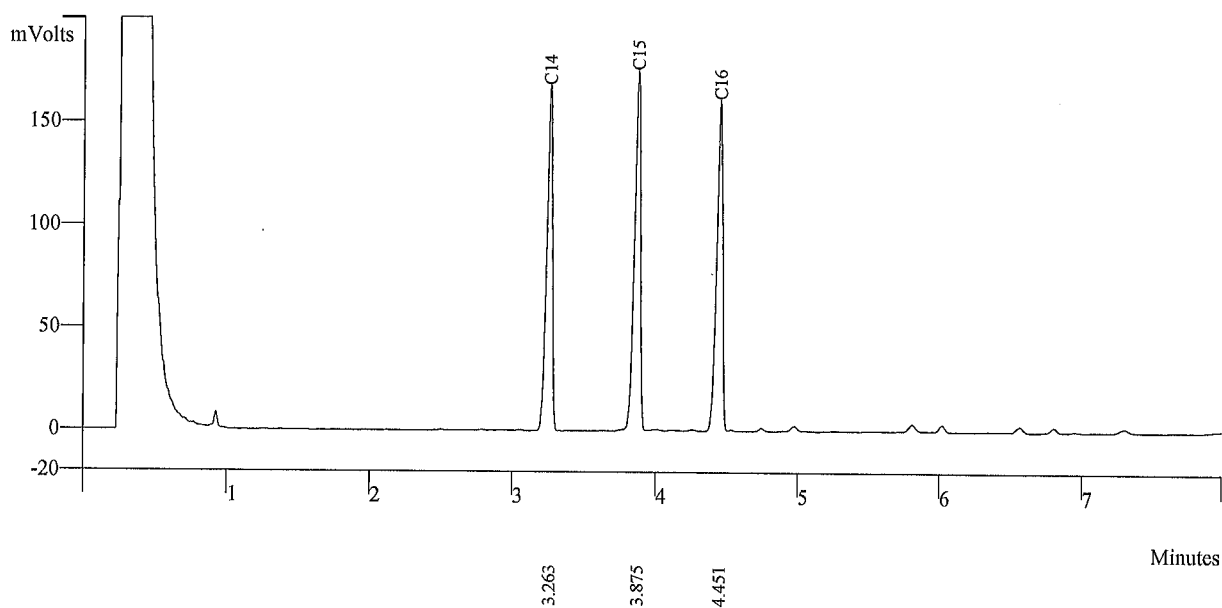
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd003.run

A = FID 10 V RESULTS



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

Sample ID: **fid std**

Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):



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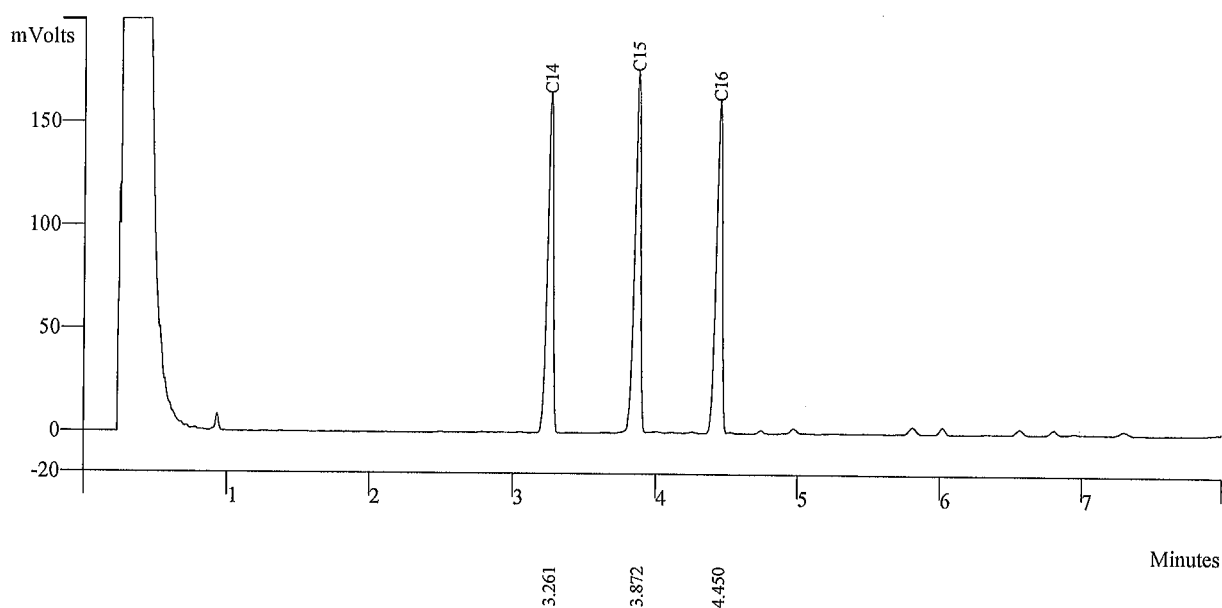
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd004.run

A = FID 10 V RESULTS



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

Sample ID: **fid std**



Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):

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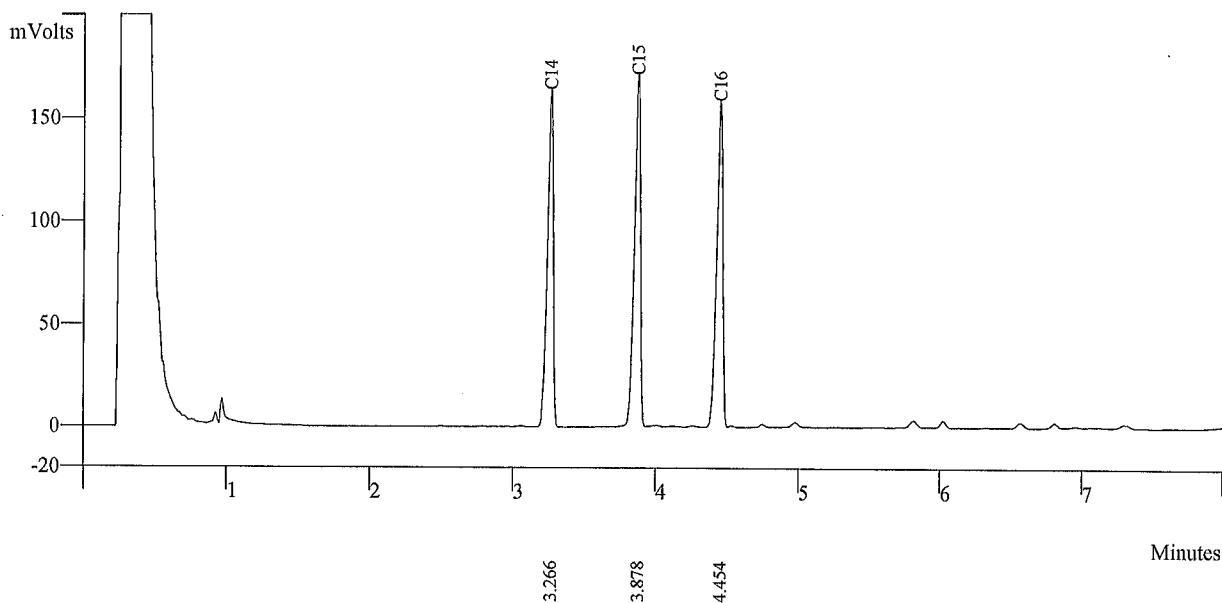
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd005.run

A = FID 10 V RESULTS



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



C14

External Standard Analysis

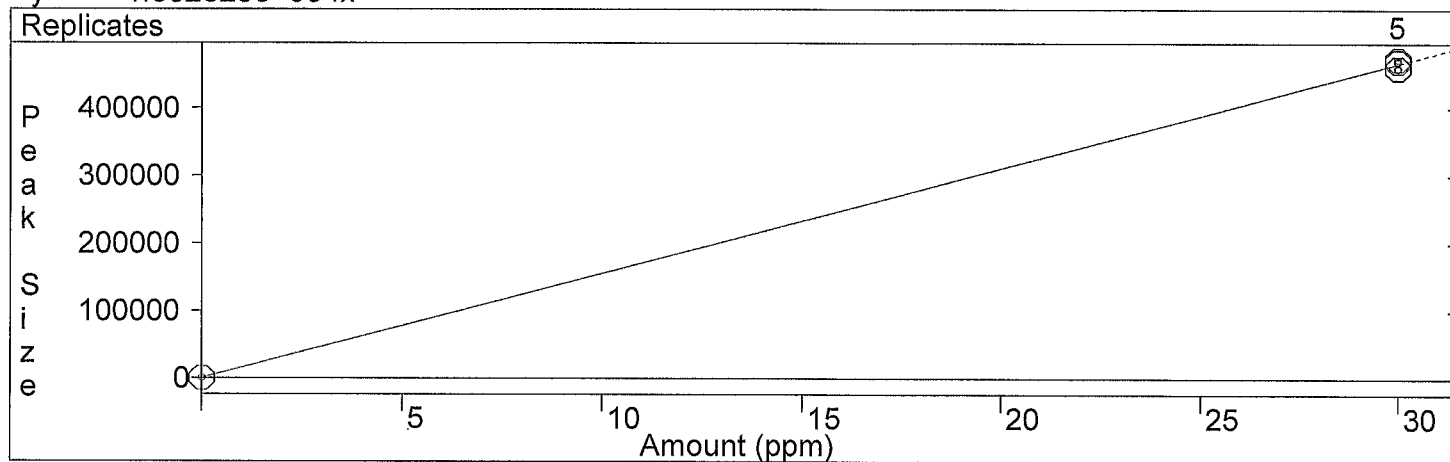
Curve Type: Linear

Origin: Force

$y = +1.552325e+004x$

Resp. Fact. RSD: 1.347%

Coeff. Det.(r^2): 0.999130



C15

External Standard Analysis

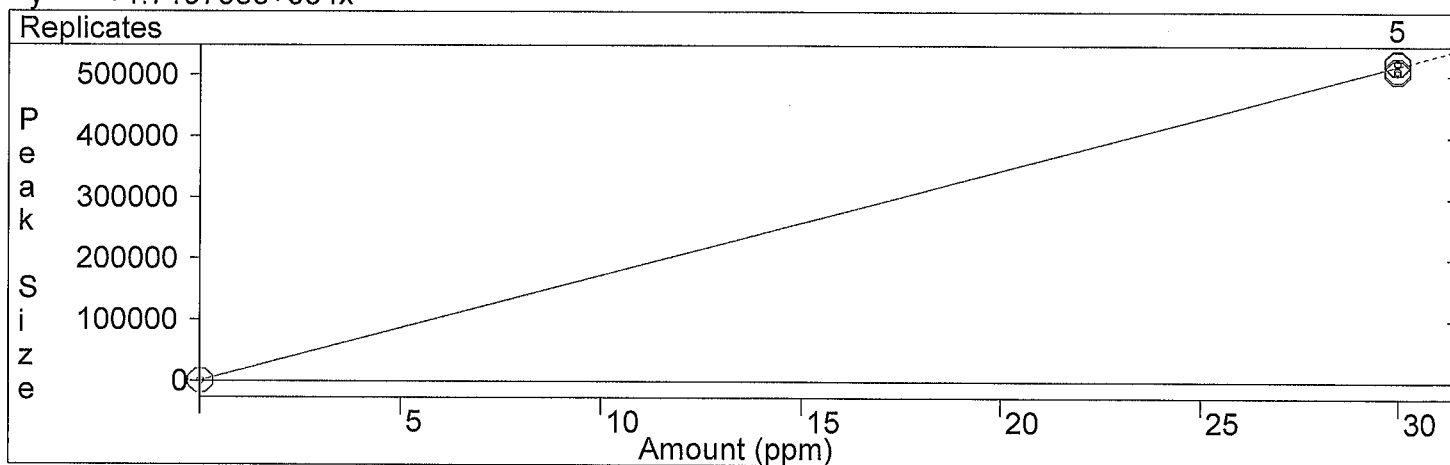
Curve Type: Linear

Origin: Force

$y = +1.719798e+004x$

Resp. Fact. RSD: 1.481%

Coeff. Det.(r^2): 0.998948



C16

External Standard Analysis

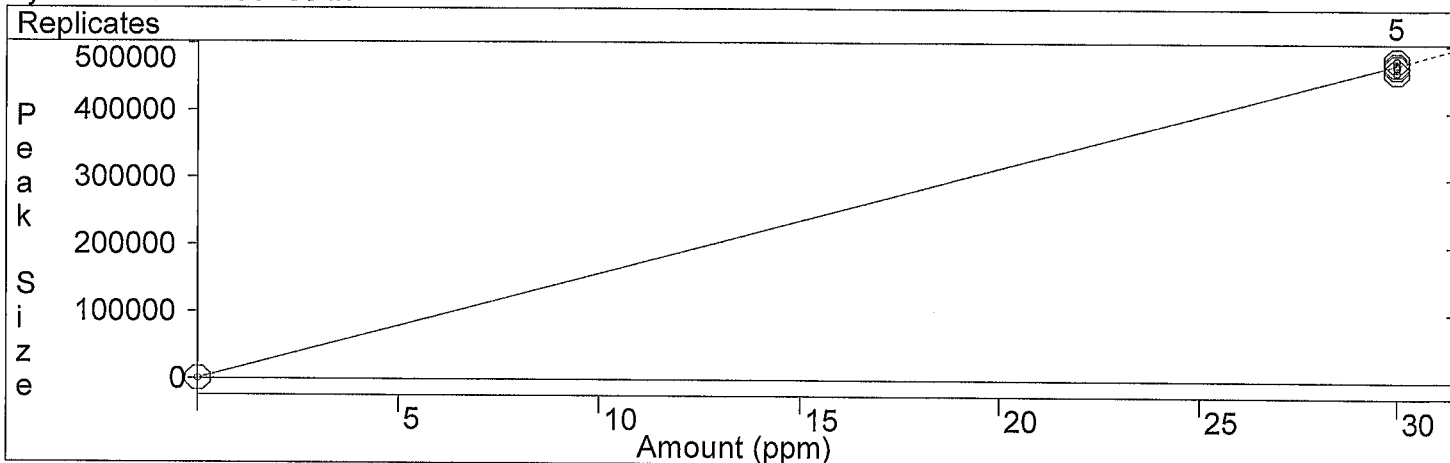
Curve Type: Linear

Origin: Force

$y = +1.572118e+004x$

Resp. Fact. RSD: 1.611%

Coeff. Det.(r^2): 0.998756



CERTIFICATE

This is to certify, that

Somchai Pohthongkham

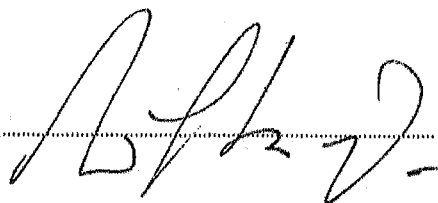
has participated the course

Basic GC and Sampler training

Date: ***24 – 27 May 2004***

Location: ***Middelburg***

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

Signature instructor: 



VARIAN

Varian Analytical Instruments
Varian Chrompack International BV
Herculesweg 8
P.O. Box 8033
4330 EA Middelburg
The Netherlands

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Fax: +31 118 633118

www.varianinc.com



WK Electric Co., Ltd.



68/242 Moo 5, Sawaipracharaj Rd., Tumbol Ladsawai, Amphur Lamlukka, Pathumthani 12150

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

Certificate of Calibration

Certificate No.: WK2412-053-1

Page 1 of 2

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

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

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

Reference standard instruments :

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

MIT : Miracle International Technology Co., Ltd.

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

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

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

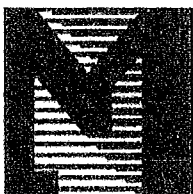
Calibrated by : Mr.Thippatai Mungpungklang

Approved by :

Ms. Budsagorn Patcha

Authorized Signatory

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



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



Certificate of Calibration

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

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

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

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

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

Calibrated by

Samak

Mr. Samak Uaonkaonoi
Metrology Technician

Approved by

Juthamas Sukhathainirun

Miss Juthamas Sukhathainirun
Cal-Lab Manager



Agilent Technologies

Certificate of Analysis

FID-TCD Performance Evaluation Sample Kit

Agilent Part
Number: 5080-8842, 18710-60170

Sample Lot
Number: 0006750304

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

Concentrations:

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

Solvent: hexane

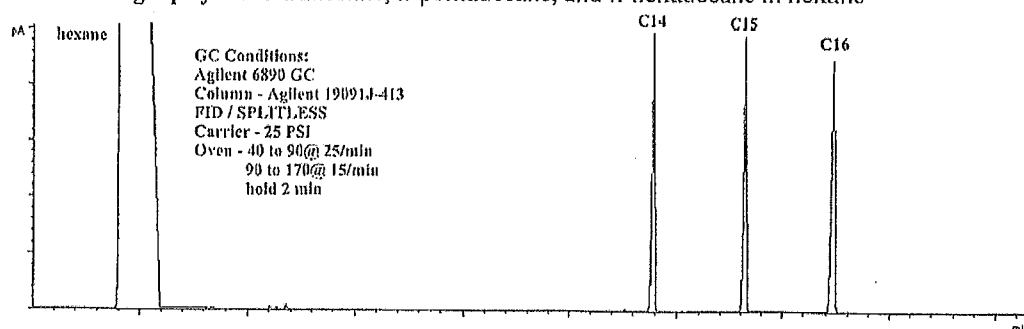
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Purities:

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

Typical Analytical Spectrum or Chromatography

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



Date of release: 30 June 2023

Date of expiration: 31 July 2025

Monica Bourgeois
Monica Bourgeois
QMS Representative

คุณภาพอากาศในสถานประกอบการ



บริษัท เอส.พี.เอส. คอนซัลติ้ง เซอร์วิส จำกัด

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

7 ซอยพหลโยธิน 24 ถนนพหลโยธิน แขวงจอมพล เขตจตุจักร กรุงเทพฯ 10900

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

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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
B41	SKC	224-PCXR4	612669	03/07/2025	1,000	1,500	2,000	999	1,498	2,001	1.001x - 3.597	1.000
B42	SKC	224-PCXR4	626041	02/07/2025	1,000	1,500	2,000	1,003	1,499	2,007	1.005x - 8.012	1.000
B43	SKC	224-PCXR4	034636	03/07/2025	1,000	1,500	2,000	1,004	1,506	1,997	0.993x + 10.787	1.000
B44	SKC	224-PCXR8	529341	02/07/2025	1,000	1,500	2,000	1,002	1,502	2,009	1.010x - 14.387	1.000
B45	SKC	224-PCXR8	529594	03/07/2025	1,000	1,500	2,000	999	1,509	1,991	0.992x + 12.045	1.000
B46	SKC	224-PCXR8	566743	03/07/2025	1,000	1,500	2,000	998	1,505	2,000	1.006x - 13.608	0.999
B47	SKC	224-PCXR8	566747	03/07/2025	1,000	1,500	2,000	1,002	1,504	1,998	1.004x - 7.545	1.000
B48	SKC	224-PCXR8	566753	02/07/2025	1,000	1,500	2,000	998	1,494	1,996	0.998x - 0.387	1.000
B49	SKC	224-PCXR8	566780	04/07/2025	1,000	1,500	2,000	1,002	1,499	1,995	1.005x - 13.932	0.999
B50	SKC	224-PCXR8	500400	03/07/2025	1,000	1,500	2,000	1,006	1,498	2,008	1.002x - 1.667	1.000
B51	SKC	224-PCXR8	500363	04/07/2025	1,000	1,500	2,000	999	1,505	2,002	1.008x - 17.209	0.999
B52	SKC	224-PCXR8	093186	02/07/2025	1,000	1,500	2,000	994	1,496	1,998	1.003x - 7.976	1.000
B53	SKC	224-PCXR8	707670	02/07/2025	1,000	1,500	2,000	997	1,512	2,002	1.004x - 6.981	1.000
B54	SKC	224-PCXR3	509821	02/07/2025	1,000	1,500	2,000	1,002	1,503	2,006	1.009x - 17.041	0.999
B55	SKC	224-PCXR3	510710	04/07/2025	1,000	1,500	2,000	1,000	1,501	1,993	0.996x + 2.606	1.000
B56	SKC	224-PCXR3	511450	02/07/2025	1,000	1,500	2,000	1,012	1,502	2,008	0.997x + 9.801	1.000
B57	SKC	224-PCXR3	510798	01/07/2025	1,000	1,500	2,000	1,001	1,493	2,004	1.003x - 2.925	1.000
B58	SKC	224-PCXR3	509852	04/07/2025	1,000	1,500	2,000	1,004	1,499	1,997	1.001x - 8.640	0.999
B59	SKC	224-PCXR3	509862	04/07/2025	1,000	1,500	2,000	1,000	1,504	2,001	0.999x + 4.160	1.000
B60	SKC	224-PCXR3	512655	01/07/2025	1,000	1,500	2,000	1,005	1,502	2,008	1.007x - 9.991	1.000
B61	SKC	224-PCXR3	503915	03/07/2025	1,000	1,500	2,000	995	1,491	1,995	1.003x - 8.373	1.000
B62	SKC	224-PCXR3	505975	03/07/2025	1,000	1,500	2,000	1,003	1,498	2,001	1.002x - 4.813	1.000
B63	SKC	224-PCXR3	511432	01/07/2025	1,000	1,500	2,000	995	1,503	1,996	1.008x - 19.707	0.999
B64	SKC	224-PCXR3	508302	01/07/2025	1,000	1,500	2,000	999	1,494	1,992	0.993x + 6.854	1.000
B65	SKC	224-PCXR3	508310	01/07/2025	1,000	1,500	2,000	1,000	1,505	2,001	1.003x - 8.089	0.999
B66	SKC	224-PCXR3	509861	02/07/2025	1,000	1,500	2,000	1,002	1,495	1,996	0.992x - 10.934	1.000
B67	SKC	224-PCXR3	506295	03/07/2025	1,000	1,500	2,000	995	1,509	1,997	1.001x - 4.236	1.000
B68	SKC	224-PCXR3	505872	03/07/2025	1,000	1,500	2,000	1,001	1,491	2,001	1.000x - 1.187	1.000
B69	SKC	224-PCXR3	508375	04/07/2025	1,000	1,500	2,000	1,006	1,505	1,998	1.005x - 11.342	0.999
B70	SKC	224-PCXR3	510623	03/07/2025	1,000	1,500	2,000	997	1,508	1,997	1.001x - 1.890	1.000
B71	SKC	224-PCXR3	508367	02/07/2025	1,000	1,500	2,000	1,001	1,506	2,004	1.006x - 12.521	0.999
B72	SKC	224-PCXR3	505977	01/07/2025	1,000	1,500	2,000	1,007	1,496	1,998	0.991x + 11.538	1.000
B73	SKC	224-PCXR3	512606	01/07/2025	1,000	1,500	2,000	1,002	1,498	1,995	0.996x + 0.711	1.000
B74	SKC	224-PCXR3	505993	01/07/2025	1,000	1,500	2,000	999	1,497	1,998	1.002x - 6.570	1.000
B75	SKC	224-PCXR3	509820	02/07/2025	1,000	1,500	2,000	998	1,499	1,996	0.999x - 0.923	1.000
B76	SKC	224-PCXR3	509811	02/07/2025	1,000	1,500	2,000	997	1,502	2,003	1.007x - 11.834	1.000
B77	SKC	224-PCXR3	508301	04/07/2025	1,000	1,500	2,000	1,005	1,505	1,993	1.000x - 3.349	0.999
B78	SKC	224-PCXR3	510677	04/07/2025	1,000	1,500	2,000	999	1,509	1,998	1.004x - 9.791	0.999
B79	SKC	224-PCXR3	510920	02/07/2025	1,000	1,500	2,000	998	1,498	1,994	0.997x + 2.162	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R01	SKC	224-PCXR4	602467	02/07/2025	1,000	1,500	2,000	997	1,510	2,008	1.008x - 10.783	1.000
R02	SKC	224-PCXR4	626450	03/07/2025	1,000	2,000	3,000	999	1,498	1,993	0.991x + 9.648	1.000
R03	SKC	224-PCXR4	691592	02/07/2025	1,000	1,500	2,000	1,005	1,501	1,998	1.006x - 13.328	0.999
R04	SKC	224-PCXR4	691672	02/07/2025	1,000	1,500	2,000	999	1,493	2,002	1.001x - 3.364	1.000
R05	SKC	224-PCXR4	798470	01/07/2025	1,000	1,500	2,000	996	1,509	2,001	1.009x - 19.500	0.999
R06	SKC	224-PCXR4	798456	01/07/2025	1,000	1,500	2,000	997	1,498	1,998	1.004x - 8.490	1.000
R07	SKC	224-PCXR4	798480	02/07/2025	1,000	1,500	2,000	998	1,494	2,001	1.006x - 11.786	1.000
R08	SKC	224-PCXR4	883215	03/07/2025	1,000	1,500	2,000	1,009	1,505	2,006	1.001x + 0.899	1.000
R09	SKC	224-PCXR4	034650	03/07/2025	1,000	1,500	2,000	996	1,508	1,999	1.008x - 17.223	0.999
R10	SKC	224-PCXR4	091765	03/07/2025	1,000	1,500	2,000	999	1,495	1,998	1.000x - 2.097	1.000
R11	SKC	224-PCXR4	091763	02/07/2025	1,000	1,500	2,000	1,002	1,498	2,002	1.010x - 18.889	0.999
R12	SKC	224-PCXR4	091568	01/07/2025	1,000	1,500	2,000	997	1,506	2,001	1.004x - 7.711	1.000
R13	SKC	224-PCXR4	091638	01/07/2025	1,000	1,500	2,000	1,006	1,498	1,997	0.991x + 13.423	1.000
R14	SKC	224-PCXR4	091764	01/07/2025	1,000	1,500	2,000	994	1,505	1,996	1.007x - 17.870	0.999
R15	SKC	224-PCXR8	529457	01/07/2025	1,000	1,500	2,000	1,005	1,504	1,994	0.995x + 5.338	1.000
R16	SKC	224-PCXR8	529643	02/07/2025	1,000	1,500	2,000	1,000	1,499	1,997	1.000x - 2.577	1.000
R17	SKC	224-PCXR8	529645	02/07/2025	1,000	1,500	2,000	996	1,507	1,993	1.004x - 12.365	0.999
R18	SKC	224-PCXR8	566756	04/07/2025	1,000	1,500	2,000	995	1,498	1,996	0.997x + 0.819	1.000
R19	SKC	224-PCXR8	566802	03/07/2025	1,000	1,500	2,000	1,003	1,499	2,002	1.012x - 22.101	0.999
R20	SKC	224-PCXR8	529089	02/07/2025	1,000	1,500	2,000	994	1,502	1,996	1.001x - 5.166	1.000
R21	SKC	224-PCXR8	665728	04/07/2025	1,000	1,500	2,000	999	1,497	2,001	1.003x - 8.170	1.000
R22	SKC	224-PCXR8	707444	04/07/2025	1,000	1,500	2,000	1,004	1,504	2,006	1.005x - 6.228	1.000
R23	SKC	224-PCXR8	761067	03/07/2025	1,000	1,500	2,000	996	1,498	1,996	0.998x - 1.215	1.000
R24	SKC	224-PCXR8	707893	01/07/2025	1,000	1,500	2,000	999	1,508	1,995	1.002x - 7.415	0.999
R25	SKC	224-PCXR8	761052	04/07/2025	1,000	1,500	2,000	1,004	1,501	1,997	0.992x + 12.437	1.000
R26	SKC	224-PCXR8	707956	04/07/2025	1,000	1,500	2,000	1,005	1,505	2,009	1.011x - 15.349	0.999
R27	SKC	224-PCXR8	707398	02/07/2025	1,000	1,500	2,000	997	1,506	1,995	1.000x - 5.721	1.000
R28	SKC	224-PCXR8	707481	02/07/2025	1,000	1,500	2,000	1,005	1,503	1,993	1.001x - 6.976	0.999
R29	SKC	224-PCXR8	707402	02/07/2025	1,000	1,500	2,000	1,004	1,496	1,992	0.995x + 1.966	1.000
R30	SKC	224-PCXR8	093811	04/07/2025	1,000	1,500	2,000	1,003	1,497	1,999	0.998x + 1.047	1.000
R31	SKC	224-PCXR8	093183	01/07/2025	1,000	1,500	2,000	1,004	1,505	1,995	0.996x + 6.964	1.000
R32	SKC	224-PCXR8	671950	01/07/2025	1,000	1,500	2,000	998	1,503	1,998	1.000x + 1.382	1.000
R33	SKC	224-PCXR4	626254	01/07/2025	1,000	1,500	2,000	999	1,507	1,997	1.006x - 14.223	0.999
R34	SKC	224-PCXR4	626131	03/07/2025	1,000	1,500	2,000	1,005	1,501	1,991	0.993x + 7.387	1.000
R35	SKC	224-PCXR8	707460	03/07/2025	1,000	1,500	2,000	999	1,499	1,999	0.997x + 3.684	1.000
R36	SKC	224-PCXR8	707446	03/07/2025	1,000	1,500	2,000	1,005	1,501	2,001	1.009x - 16.388	0.999
R37	SKC	224-PCXR8	707432	01/07/2025	1,000	1,500	2,000	1,000	1,498	2,003	1.000x - 0.875	1.000
R38	SKC	224-PCXR8	707349	01/07/2025	1,000	1,500	2,000	998	1,492	2,002	1.003x - 8.681	1.000
R39	SKC	224-PCXR8	761095	02/07/2025	1,000	1,500	2,000	1,003	1,499	2,001	1.001x - 0.859	1.000

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

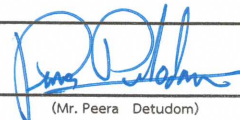
Temperature : 25 \pm 3 $^{\circ}$ C
Pressure : 1010 \pm 15 mmbar

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (mL/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)				
					1	2	3	1	2	3	y	R ²
R40	SKC	224-PCXR4	612753	02/07/2025	1,000	1,500	2,000	1,003	1,503	1,994	1.004x - 11.618	0.999
R41	SKC	224-PCXR4	626140	02/07/2025	1,000	1,500	2,000	995	1,495	1,993	1.008x - 22.708	0.999
R42	SKC	224-PCXR4	626463	02/07/2025	1,000	1,500	2,000	1,001	1,497	1,991	0.994x + 7.539	1.000
R43	SKC	224-PCXR4	626129	01/07/2025	1,000	1,500	2,000	1,007	1,507	2,001	1.005x - 8.869	0.999
R44	SKC	224-PCXR4	602753	01/07/2025	1,000	1,500	2,000	1,002	1,499	1,997	0.999x - 0.384	1.000
R45	SKC	224-PCXR4	626137	02/07/2025	1,000	1,500	2,000	995	1,508	2,007	1.008x - 11.542	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 ²
H-R01	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	500.4	999.6	2002.7	0.999x + 1.975	1.000
H-R02	Dwyer	VFB-65	04/07/2025	500	1,000	2,000	499.3	998.9	1998.1	1.000x - 0.723	1.000
H-R03	Dwyer	VFB-65	03/07/2025	500	1,000	2,000	500.5	998.7	1996.7	0.998x + 2.184	0.999
H-R04	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	501.7	998.1	1993.3	1.000x - 2.212	0.999
H-R05	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	499.2	997.5	1997.1	1.002x - 3.115	1.000
H-R06	Dwyer	VFB-65	02/07/2025	500	1,000	2,000	499.8	997.4	1993.2	1.001x - 4.572	0.999

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Rotameter Calibration Report (For Personal Pump Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136164

Calibration Data

Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
L-R01	Dwyer	VFA-21	04/07/2025	50	100	200	50.9	100.4	201.3	1.001x + 0.676	1.000
L-R02	Dwyer	VFA-21	04/07/2025	50	100	200	50.3	101.8	201.0	1.003x + 0.005	0.999
L-R03	Dwyer	VFA-21	03/07/2025	50	100	200	50.6	100.9	201.1	0.999x + 0.565	1.000
L-R04	Dwyer	VFA-21	02/07/2025	50	100	200	50.5	100.4	200.8	0.997x + 0.797	1.000
L-R05	Dwyer	VFA-21	02/07/2025	50	100	200	50.1	101.7	200.9	1.002x - 0.024	0.999
L-R06	Dwyer	VFA-21	02/07/2025	50	100	200	50.3	101.5	200.8	1.000x + 0.647	1.000

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

Peera Detudom
(Mr. Peera Detudom)



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Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

Temperature : 25 ± 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.)			y	R ²
					1	2	3	1	2	3		
R01	SKC	224-PCXR4	602467	01/10/2025	1,000	1,500	2,000	1,001	1,504	2,006	1.001x + 1.123	1.000
R02	SKC	224-PCXR4	626450	01/10/2025	1,000	2,000	3,000	997	1,511	1,997	1.000x - 2.215	1.000
R03	SKC	224-PCXR4	691592	01/10/2025	1,000	1,500	2,000	1,004	1,504	2,008	1.005x - 5.705	1.000
R04	SKC	224-PCXR4	691672	01/10/2025	1,000	1,500	2,000	1,013	1,505	2,007	0.996x + 7.748	0.999
R05	SKC	224-PCXR4	798470	01/10/2025	1,000	1,500	2,000	1,005	1,506	2,010	1.007x - 4.757	1.000
R06	SKC	224-PCXR4	798456	01/10/2025	1,000	1,500	2,000	996	1,503	1,999	1.003x - 5.913	1.000
R07	SKC	224-PCXR4	798480	03/10/2025	1,000	1,500	2,000	997	1,502	1,996	1.000x - 8.975	0.999
R08	SKC	224-PCXR4	883215	03/10/2025	1,000	1,500	2,000	1,005	1,504	1,995	0.999x - 0.068	1.000
R09	SKC	224-PCXR4	034650	03/10/2025	1,000	1,500	2,000	994	1,505	1,998	1.005x - 11.989	1.000
R10	SKC	224-PCXR4	091765	01/10/2025	1,000	1,500	2,000	1,005	1,508	2,006	1.008x - 11.738	0.999
R11	SKC	224-PCXR4	091763	01/10/2025	1,000	1,500	2,000	1,006	1,493	2,003	0.996x + 5.589	1.000
R12	SKC	224-PCXR4	091568	02/10/2025	1,000	1,500	2,000	995	1,496	1,999	1.002x - 5.717	1.000
R13	SKC	224-PCXR4	091638	01/10/2025	1,000	1,500	2,000	1,012	1,505	2,008	1.004x - 2.938	0.999
R14	SKC	224-PCXR4	091764	01/10/2025	1,000	1,500	2,000	996	1,494	2,004	1.008x - 18.690	1.000
R15	SKC	224-PCXR8	529457	01/10/2025	1,000	1,500	2,000	998	1,507	2,007	1.007x - 12.957	0.999
R16	SKC	224-PCXR8	529643	01/10/2025	1,000	1,500	2,000	997	1,496	1,994	0.999x - 1.395	1.000
R17	SKC	224-PCXR8	529645	01/10/2025	1,000	1,500	2,000	1,005	1,503	1,995	1.005x - 10.886	0.999
R18	SKC	224-PCXR8	566756	01/10/2025	1,000	1,500	2,000	997	1,505	1,993	1.000x - 4.450	1.000
R19	SKC	224-PCXR8	566802	01/10/2025	1,000	1,500	2,000	1,004	1,504	2,007	1.006x - 6.752	1.000
R20	SKC	224-PCXR8	529089	03/10/2025	1,000	1,500	2,000	1,008	1,497	2,001	1.002x - 6.225	0.999
R21	SKC	224-PCXR8	665728	03/10/2025	1,000	1,500	2,000	997	1,505	2,003	1.006x - 16.975	0.999
R22	SKC	224-PCXR8	707444	01/10/2025	1,000	1,500	2,000	1,005	1,494	2,001	0.995x + 6.369	1.000
R23	SKC	224-PCXR8	761067	01/10/2025	1,000	1,500	2,000	1,008	1,495	2,000	0.992x + 13.025	1.000
R24	SKC	224-PCXR8	707893	01/10/2025	1,000	1,500	2,000	1,005	1,504	1,997	1.004x - 8.140	0.999
R25	SKC	224-PCXR8	761052	01/10/2025	1,000	1,500	2,000	1,006	1,510	2,006	1.001x - 0.152	0.999
R26	SKC	224-PCXR8	707956	01/10/2025	1,000	1,500	2,000	1,000	1,513	2,008	1.008x - 10.714	1.000
R27	SKC	224-PCXR8	707398	02/10/2025	1,000	1,500	2,000	1,011	1,512	2,012	1.002x + 2.547	0.999
R28	SKC	224-PCXR8	707481	02/10/2025	1,000	1,500	2,000	999	1,498	2,000	1.000x + 0.144	1.000
R29	SKC	224-PCXR8	707402	02/10/2025	1,000	1,500	2,000	1,000	1,509	2,006	1.004x - 5.501	1.000
R30	SKC	224-PCXR8	093811	02/10/2025	1,000	1,500	2,000	998	1,514	2,005	1.009x - 10.222	1.000
R31	SKC	224-PCXR8	093183	01/10/2025	1,000	1,500	2,000	999	1,508	2,003	1.005x - 9.587	1.000
R32	SKC	224-PCXR8	671950	01/10/2025	1,000	1,500	2,000	1,000	1,494	1,996	0.994x + 5.137	1.000
R33	SKC	224-PCXR4	626254	01/10/2025	1,000	1,500	2,000	1,004	1,493	2,005	1.008x - 16.151	0.999
R34	SKC	224-PCXR4	626131	01/10/2025	1,000	1,500	2,000	998	1,508	1,994	0.998x - 0.764	1.000
R35	SKC	224-PCXR8	707460	01/10/2025	1,000	1,500	2,000	1,003	1,502	1,993	0.993x + 8.172	1.000
R36	SKC	224-PCXR8	707446	01/10/2025	1,000	1,500	2,000	997	1,510	1,999	1.004x - 8.044	1.000
R37	SKC	224-PCXR8	707432	01/10/2025	1,000	1,500	2,000	1,012	1,515	2,007	0.997x + 7.376	0.999
R38	SKC	224-PCXR8	707349	03/10/2025	1,000	1,500	2,000	999	1,511	1,998	1.001x - 2.918	1.000
R39	SKC	224-PCXR8	761095	03/10/2025	1,000	1,500	2,000	1,008	1,514	1,996	0.993x + 11.058	0.999

Calibrated by :

Adul Dangklom
(Mr. Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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

Personal Pump Calibration Report

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Environmental Conditions

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

Personal Pump Data				Calibration Data								
No.	Brand	Model	Serial No.	Date	Flow Rate (ml/min)						Value From Calibration Curve	
					Setting			Actual (Q std.)			y	R ²
					1	2	3	1	2	3		
R40	SKC	224-PCXR4	612753	03/10/2025	1,000	1,500	2,000	1,005	1,504	2,007	1.003x - 2.699	1.000
R41	SKC	224-PCXR4	626140	03/10/2025	1,000	1,500	2,000	998	1,498	2,000	1.001x - 1.631	1.000
R42	SKC	224-PCXR4	626463	03/10/2025	1,000	1,500	2,000	1,004	1,496	1,999	0.993x + 9.615	1.000
R43	SKC	224-PCXR4	626129	03/10/2025	1,000	1,500	2,000	1,002	1,505	2,003	1.008x - 13.761	0.999
R44	SKC	224-PCXR4	602753	01/10/2025	1,000	1,500	2,000	1,004	1,503	1,999	1.006x - 9.411	0.999
R45	SKC	224-PCXR4	626137	01/10/2025	1,000	1,500	2,000	997	1,504	1,998	1.002x - 3.862	1.000

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@spscon.com, www.spscon.com

Rotameter Calibration Report (For Personal Pump High Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

Calibration Data											
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
H-R01	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	501.1	997.7	1996.7	1.000x - 2.348	0.999
H-R02	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.3	999.2	1997.5	1.001x - 2.181	1.000
H-R03	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	500.9	1001.1	1999.3	0.999x + 0.708	0.999
H-R04	Dwyer	VFB-65	02/10/2025	500	1,000	2,000	501.4	999.4	1998.9	0.997x + 3.139	1.000
H-R05	Dwyer	VFB-65	01/10/2025	500	1,000	2,000	500.5	1000.7	1998.2	0.998x + 2.480	1.000
H-R06	Dwyer	VFB-65	03/10/2025	500	1,000	2,000	502.0	998.5	1994.8	1.000x - 1.968	0.999

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 Low Flow Adjust)

Calibration Method : Dry Cal Primary Flowmeter

Model : Defender 510-H

S/N : 136833

Calibration Data

Calibration Data											
Rotameter Data			Calibration Data								
No.	Brand	Model	Date	Flow Rate (mL/min)						Value From Calibration Curve	
				Flow Rate (Reading)			Actual (Q std.)				
				1	2	3	1	2	3	y	R ²
L-R01	Dwyer	VFA-21	01/10/2025	50	100	200	50.3	101.0	200.7	0.997x + 0.613	1.000
L-R02	Dwyer	VFA-21	01/10/2025	50	100	200	50.1	101.2	200.1	1.001x - 0.303	0.999
L-R03	Dwyer	VFA-21	02/10/2025	50	100	200	49.7	99.8	199.9	1.002x - 0.371	1.000
L-R04	Dwyer	VFA-21	02/10/2025	50	100	200	50.2	100.9	200.6	1.000x - 0.110	0.999
L-R05	Dwyer	VFA-21	01/10/2025	50	100	200	50.7	100.8	200.3	0.999x + 0.555	1.000
L-R06	Dwyer	VFA-21	03/10/2025	50	100	200	50.5	99.7	201.1	0.998x + 0.476	1.000

Calibrated by :

Adul Dangklom
(Mr.Adul Dangklom)

Approved by :

(Mr. Peera Detudom)



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





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

GAS CHROMATOGRAPH TEST CERTIFICATION

Certificate No. : SV0825/23032

Instrument Type : Gas Chromatography

Model : 3800

Serial Number : 00734

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

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

Date : 02/08/2025

ELECTRONIC TEST

CPU	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL
DISPLAY & LED 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 Detectors (FID Channel-Front)

INJECTOR : 1079 Injector

GC CONDITION:

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

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

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

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



VARIAN



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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

Detector Sensitivity (FID)

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

Temperature Specification

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

Relative Standard Deviation % (%RSD)

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

APPROVAL :

Signature:

Engineer : Somchai Pohtongkam

Date : 02/08/2025



VARIAN



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THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200

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

Results Integrated System Testing

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

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

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

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

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	<i>Sachin P.</i>	
Date	02/08/2025	



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



VARIAN



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

Results Integrated System Testing

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

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

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

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

Compliance	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Performance by	<i>Sanchul P.</i>	
Date	02/08/2025	



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



VARIAN

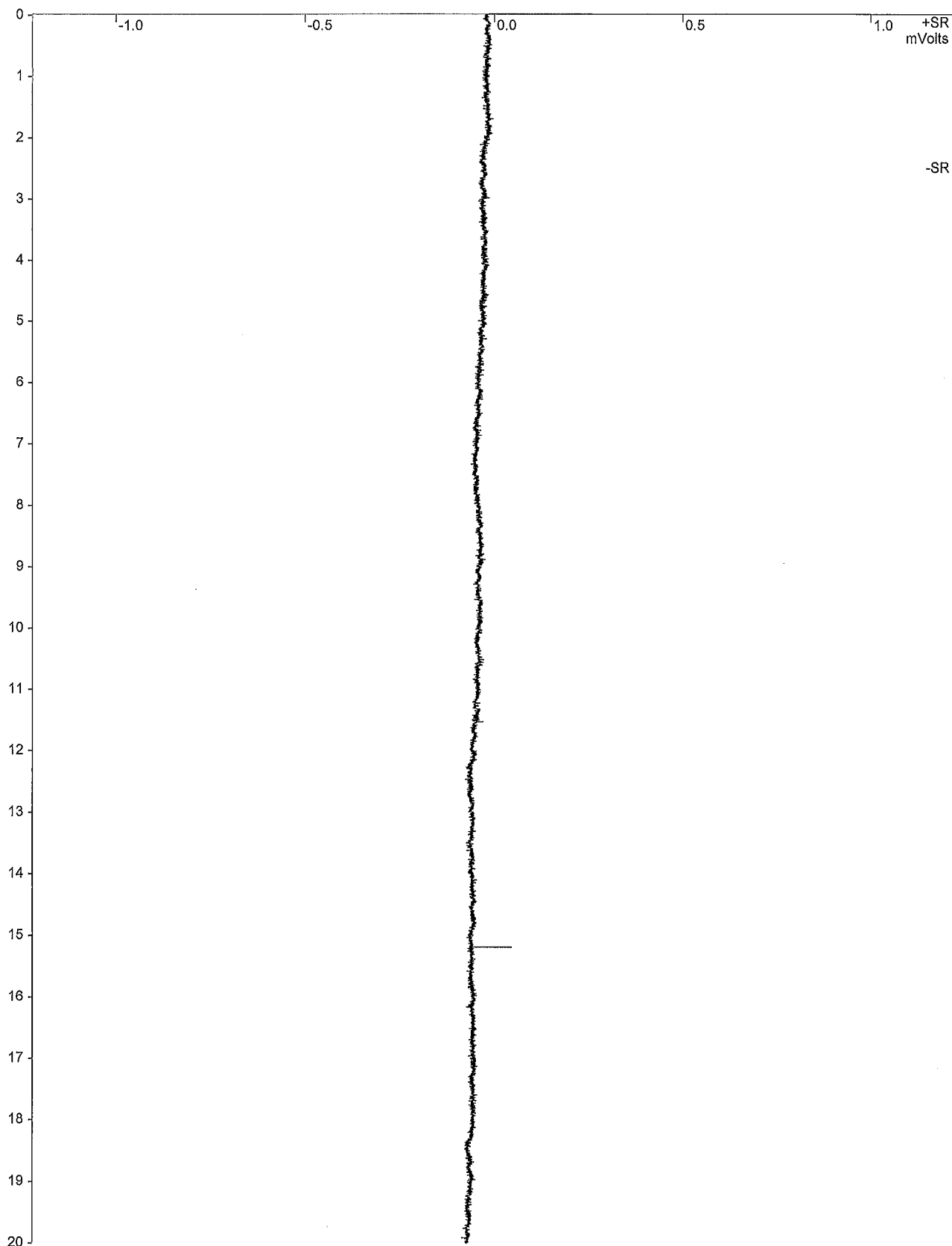
Title :
Run File : e:\sps2025\blk001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : blk

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

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

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

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



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

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

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

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

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

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

Total Unidentified Counts : 0 counts

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

Multiplier: 1 Divisor: 1 Unidentified Peak Factor: 0

Baseline Offset: -14 microVolts LSB: 1 microVolts

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

Manual injection

Data Handling: No peaks

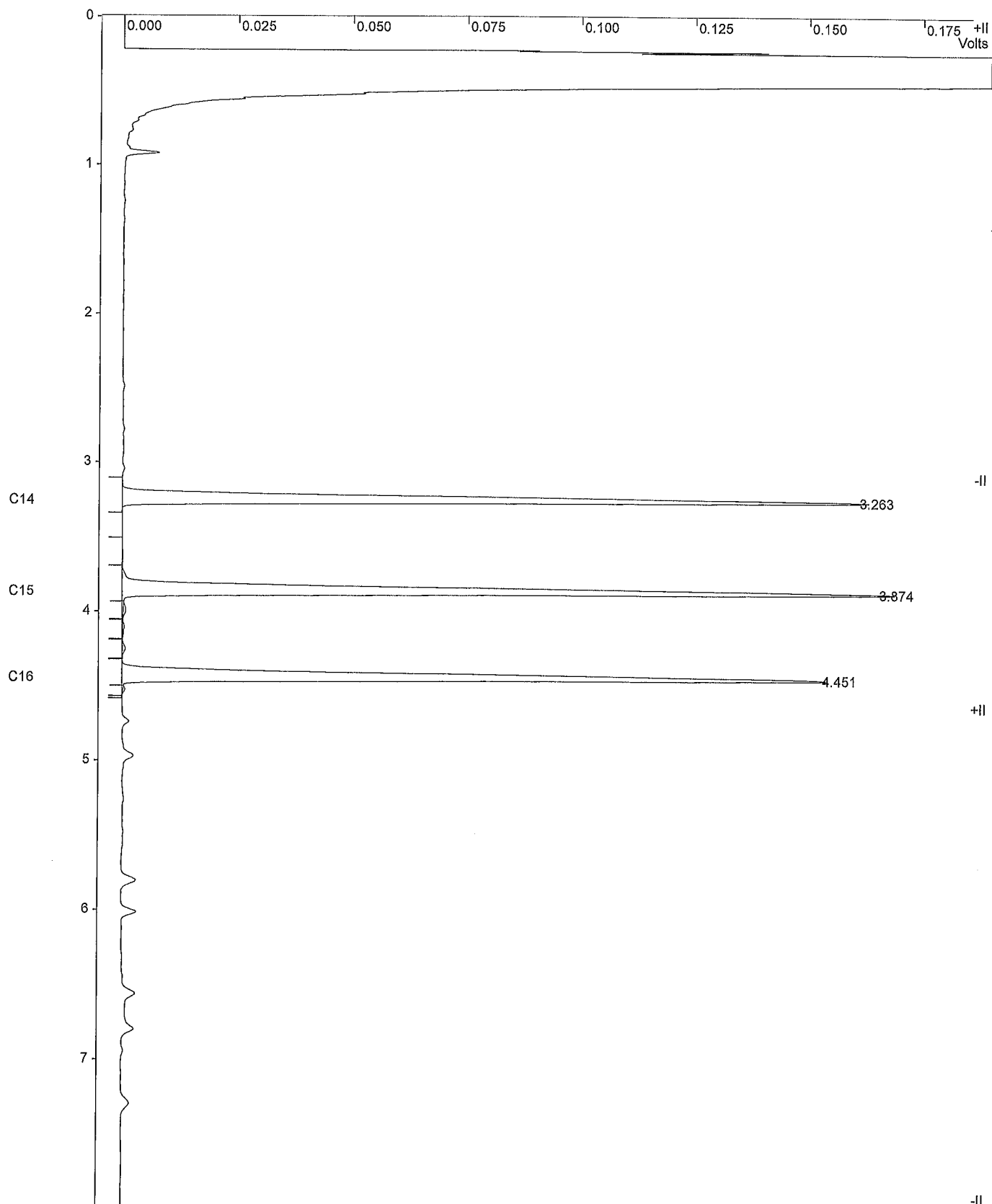
Title :
Run File : e:\sps2025\fidstd001.run
Method File : c:\star\data\tu\2025\cal fid.mth
Sample ID : fidstd

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

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

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

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



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

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

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

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

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

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

Total Unidentified Counts : 0 counts

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

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

Baseline Offset: 6 microVolts LSB: 1 microVolts

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

Manual injection

Sample ID: **fid std**

Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):



VARIAN

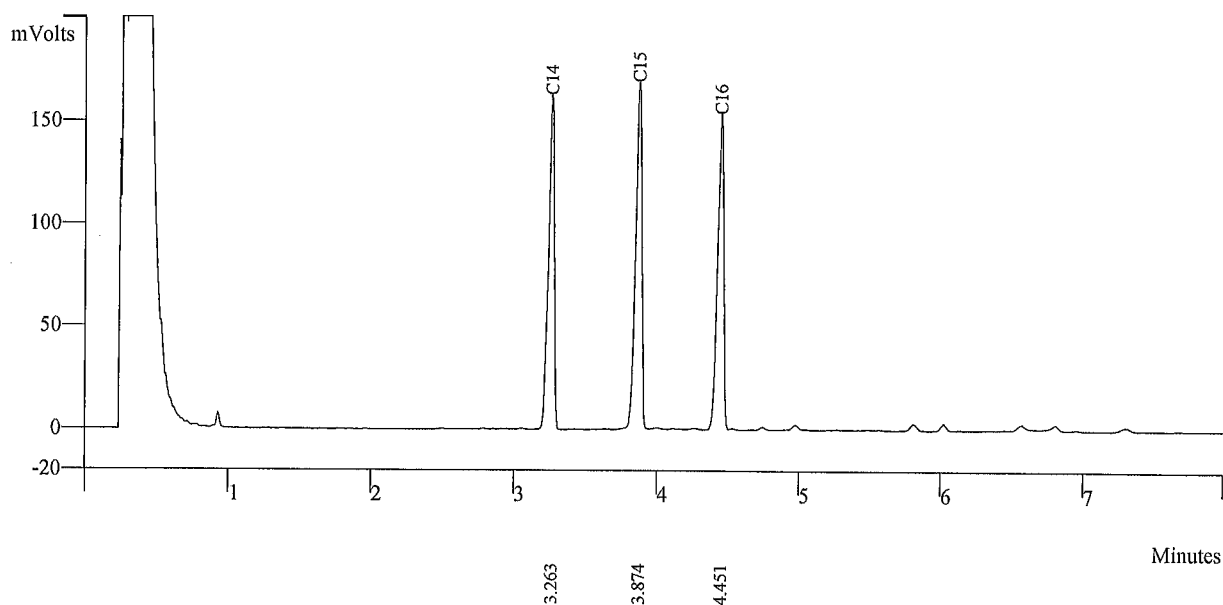
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd001.run

A = FID 10 V RESULTS



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



Sample ID: **fid std**



Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):

VARIAN

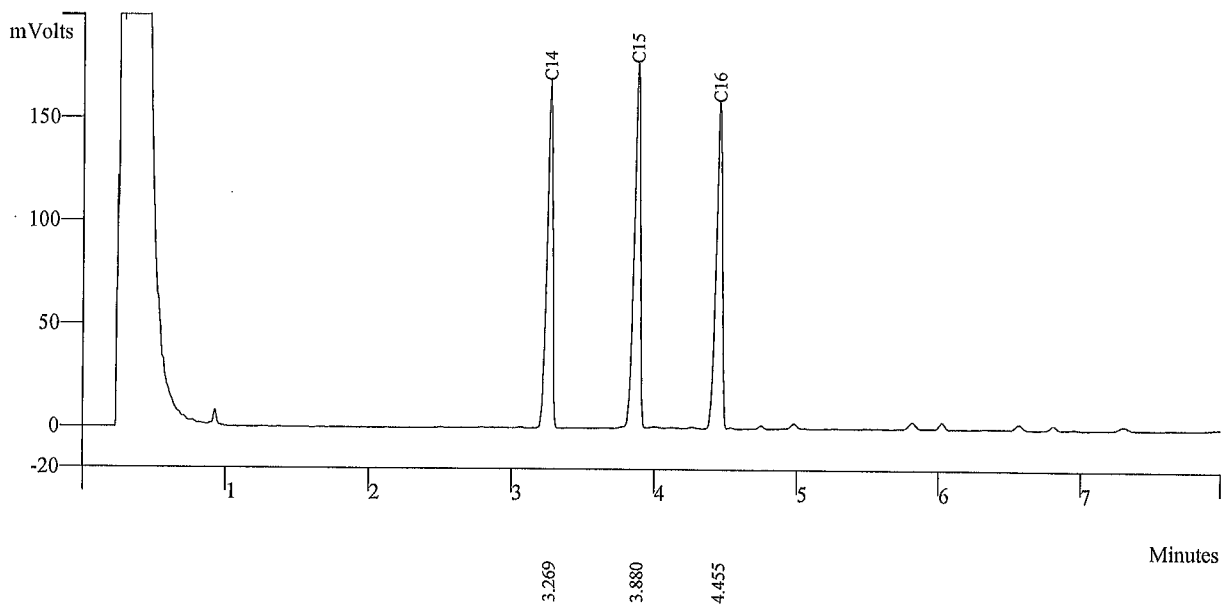
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd002.run

A = FID 10 V RESULTS



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



Sample ID: **fid std**

Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):



VARIAN

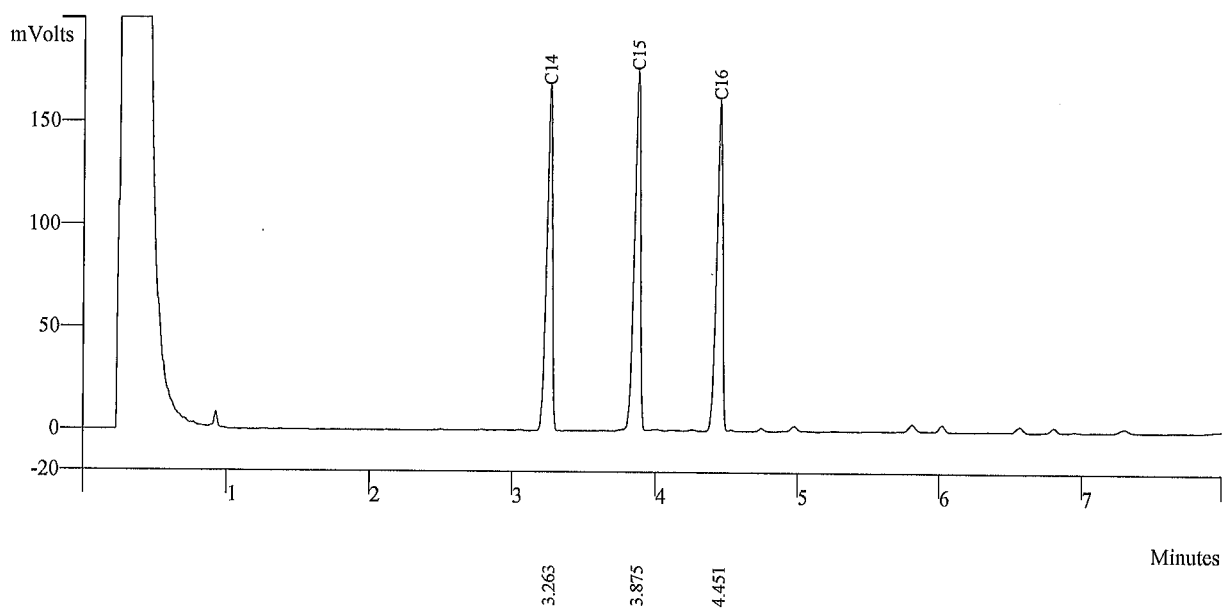
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd003.run

A = FID 10 V RESULTS



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

Sample ID: **fid std**

Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):



VARIAN

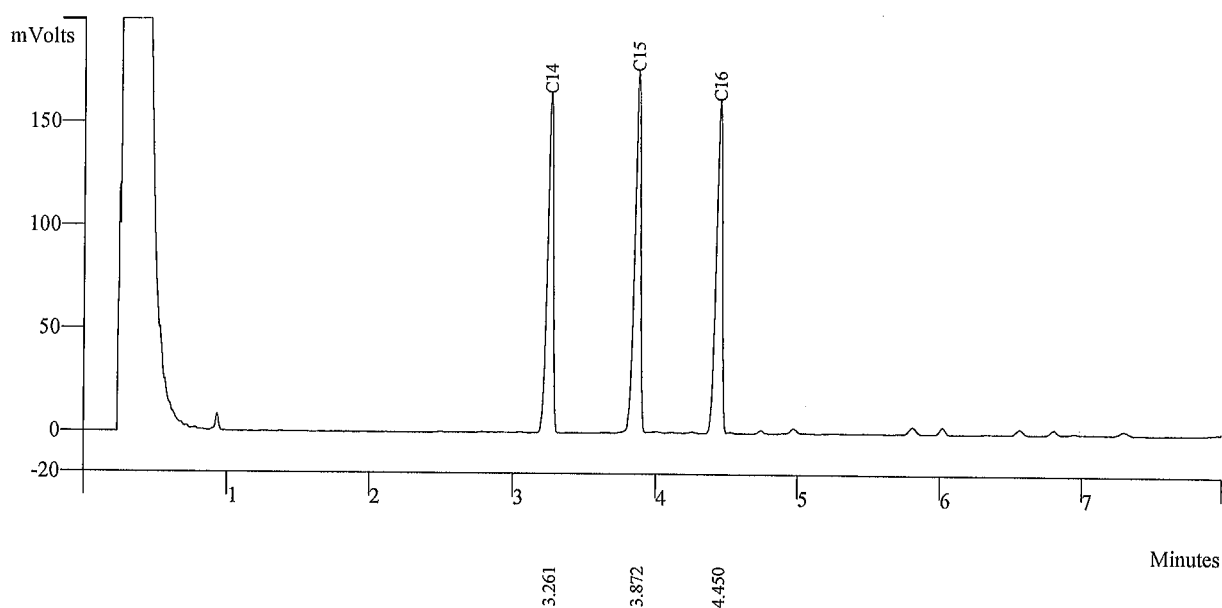
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd004.run

A = FID 10 V RESULTS



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

Sample ID: **fid std**



Operator (Inj): **watsamon**

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

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

Run Time (min): **7.993**

Workstation: **GC-LAB**

Instrument (Inj):

VARIAN

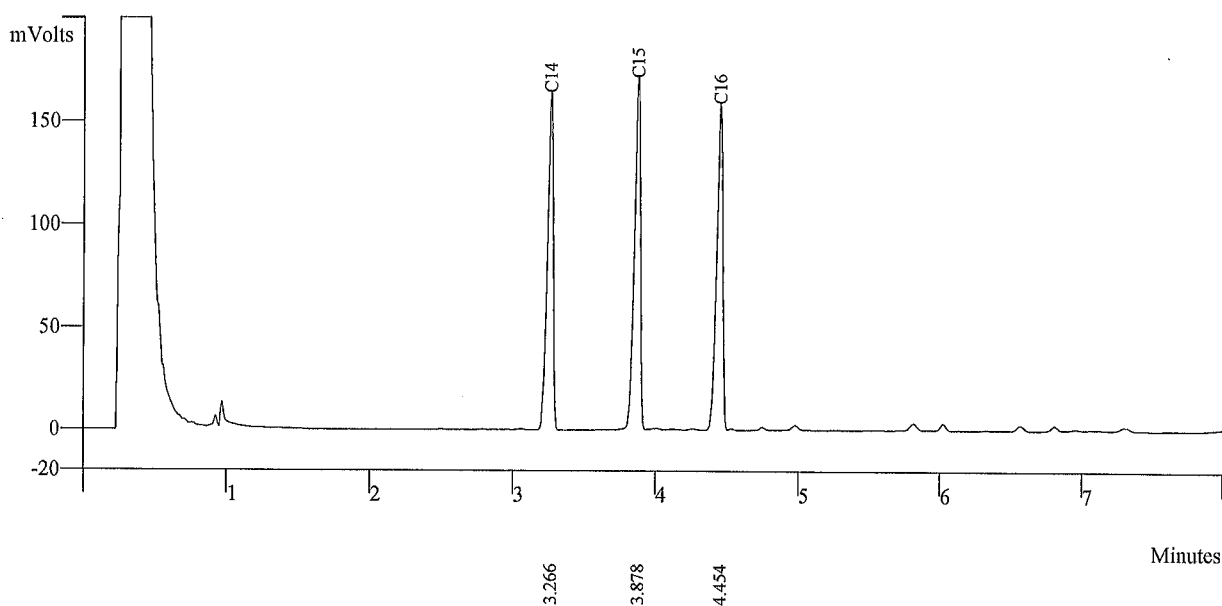
Run Mode: **Calibration**

Peak Measurement: **Peak Area**

Calculation Type: **External Std.**

e:\sps2025\fidstd005.run

A = FID 10 V RESULTS



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



C14

External Standard Analysis

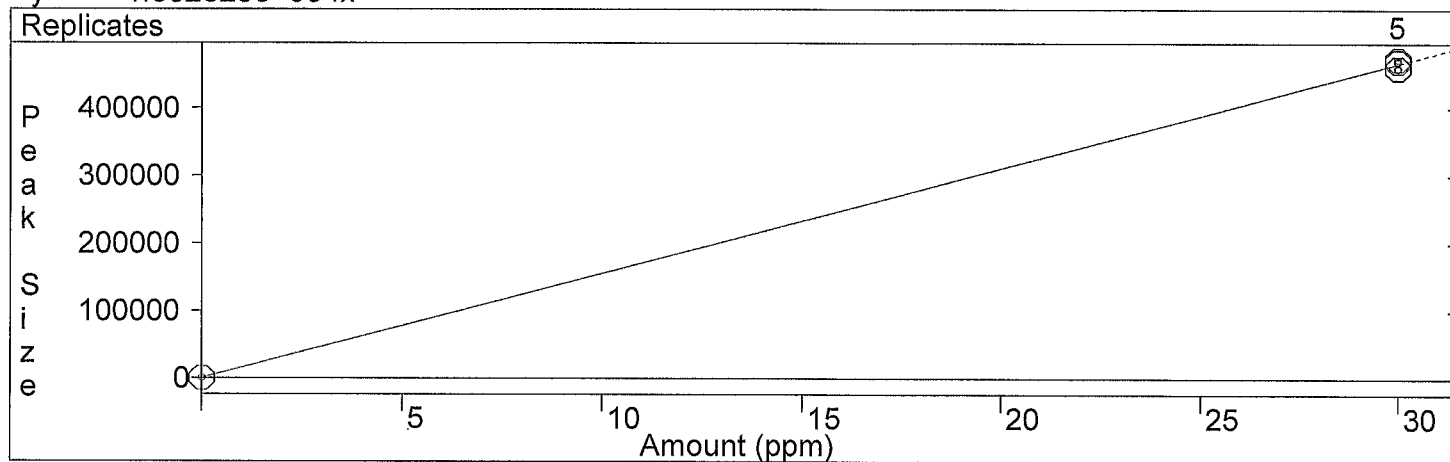
Curve Type: Linear

Origin: Force

$$y = +1.552325e+004x$$

Resp. Fact. RSD: 1.347%

Coeff. Det.(r²): 0.999130



C15

External Standard Analysis

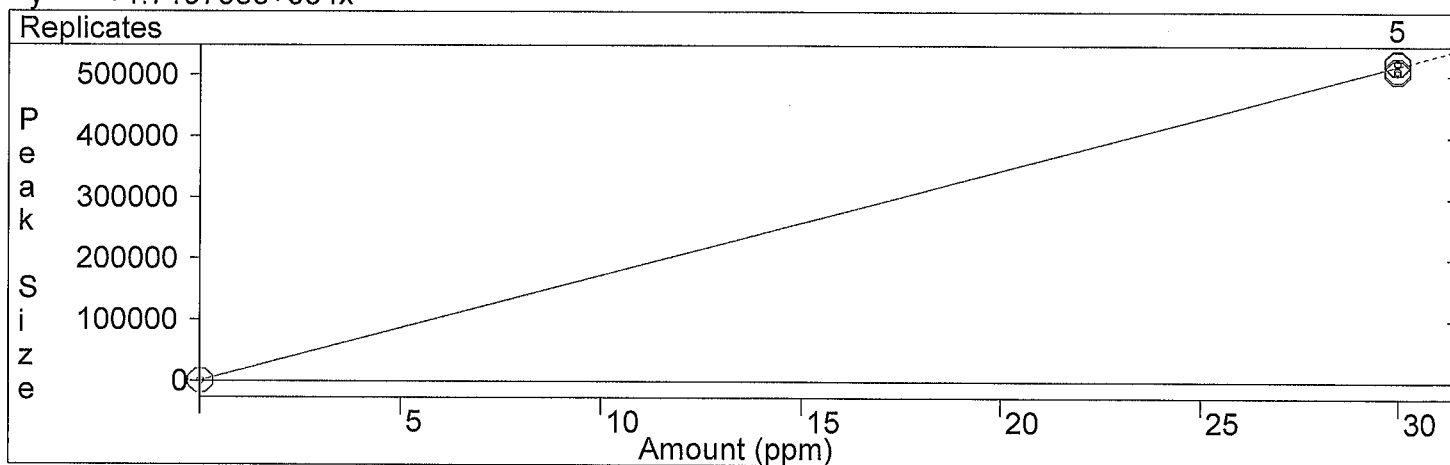
Curve Type: Linear

Origin: Force

$$y = +1.719798e+004x$$

Resp. Fact. RSD: 1.481%

Coeff. Det.(r²): 0.998948



C16

External Standard Analysis

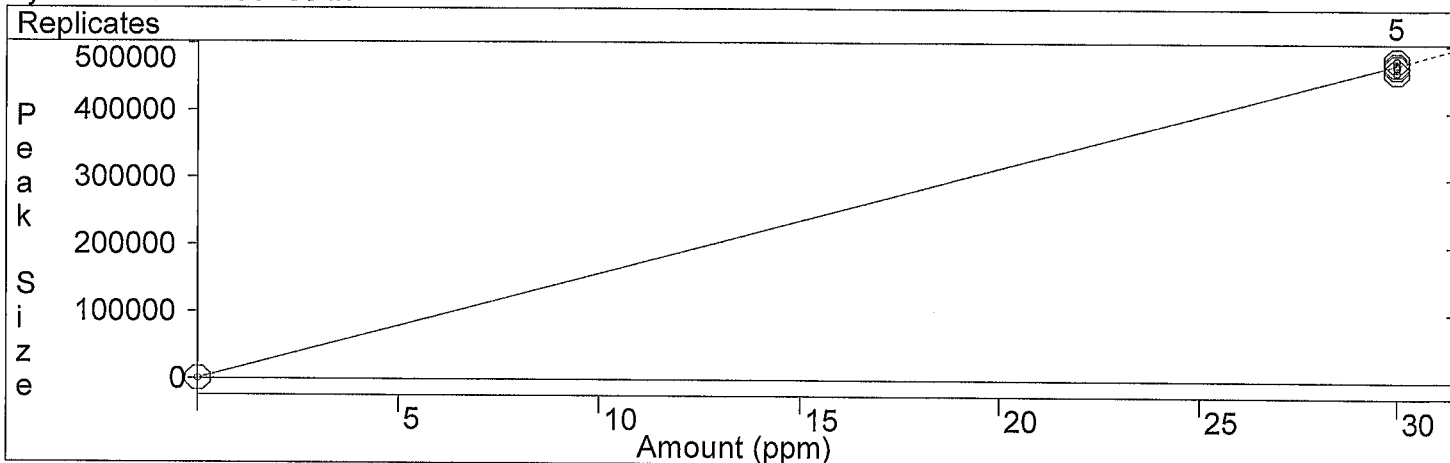
Curve Type: Linear

Origin: Force

$$y = +1.572118e+004x$$

Resp. Fact. RSD: 1.611%

Coeff. Det.(r²): 0.998756



CERTIFICATE

This is to certify, that

Somchai Pohthongkham

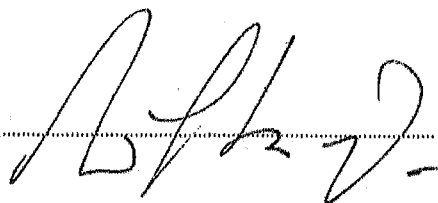
has participated the course

Basic GC and Sampler training

Date: ***24 – 27 May 2004***

Location: ***Middelburg***

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

Signature instructor: 



VARIAN

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Varian Chrompack International BV
Herculesweg 8
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The Netherlands

Tel.: +31 118 671000
Fax: +31 118 633118

www.varianinc.com



WK Electric Co., Ltd.



68/242 Moo 5, Sawaipracharaj Rd., Tumbol Ladsawai, Amphur Lamlukka, Pathumthani 12150

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

Certificate of Calibration

Certificate No.: WK2412-053-1

Page 1 of 2

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

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

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

Reference standard instruments :

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

MIT : Miracle International Technology Co., Ltd.

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

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

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

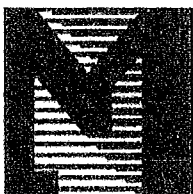
Calibrated by : Mr.Thippatai Mungpungklang

Approved by :

Ms. Budsagorn Patcha

Authorized Signatory

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



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



Certificate of Calibration

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

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

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

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

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

Calibrated by

Samak

Mr. Samak Uaonkaonoi
Metrology Technician

Approved by

Juthamas Sukhathainirun

Miss Juthamas Sukhathainirun
Cal-Lab Manager



Agilent Technologies

Certificate of Analysis

FID-TCD Performance Evaluation Sample Kit

Agilent Part
Number: 5080-8842, 18710-60170

Sample Lot
Number: 0006750304

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

Concentrations:

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

Solvent: hexane

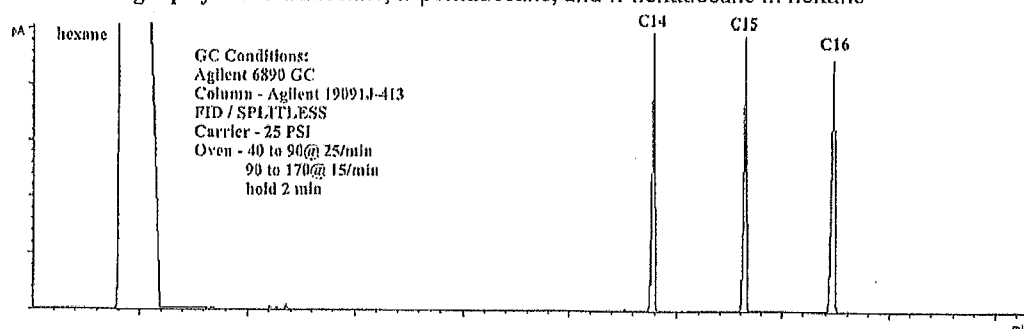
Calibrated Class A glassware and clean bottles were used in the manufacture of this standard. Balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001.

Purities:

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

Typical Analytical Spectrum or Chromatography

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



Date of release: 30 June 2023

Date of expiration: 31 July 2025

Monica Bourgeois
QMS Representative

ระดับเสียง



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

CALIBRATION CERTIFICATE

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

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

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

Instrument Calibrated :

Description : Sound Calibrator

Manufacturer : ACO

Model : 2127

Serial No. : 130006

Ambient Environment

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

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

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

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
 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 : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2
W

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

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FM.BL.MTC.002 Rev.5

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Fax. (66) 0 2577 9009

Office/Laboratory

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

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 44/0268

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.81	-0.19	± 0.10	± 0.40 dB

2. Frequency

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

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.95	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011268021900739001

End of Certificate

2 / 2

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(66) 08 1889 6827



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 45/0268

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 : Acoustic Calibrator

Manufacturer : Cirrus Research plc

Model : CR:515

Serial No. : 92002

Ambient Environment

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

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

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

- Standards used :**
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
 3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
 4. Digital Multimeter Agilent 34401A S/N MY44005560.
 5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
 6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
 7. Condenser Microphone B&K 4180 S/N 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 : 19 Feb. 2025

Date of Calibration : 21 Feb. 2025

1 / 2
W

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FM.BL.MTC.002 Rev.5

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(66) 08 1889 6827

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0220

MTC No. EEL. BP. 45/0268

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

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

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.98	-0.02	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.1	0.1	± 1.5	$\pm 1.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.65	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


.....
(Mr. Weerachai Deechaiyae)

Approved by :



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

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 21 Feb. 2025

Date of Issue : 24 Feb. 2025

Ref : 2011268021900739002

End of Certificate

2 / 2

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FM.BL.MTC.002 Rev.5

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



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

Noise R_532/25

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-R19	ACO	6236	00182001	09 September 2025	93.9	93.9
ACO-R20	ACO	6236	00182003	09 September 2025	93.9	93.9
ACO-R21	ACO	6236	00182004	09 September 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.
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_633-1/25

Sound Level Meter Calibration Report

Acoustic Calibrator Data

Brand	CIRRUS	Number	AC-CR01/63
Model	CR515	Serial No.	92002
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
CR-B05	Cirrus	CR161B	G301134	10 November 2025	94	94
Acoustic Certified Value : Thailand Institute of Scientific and Technological Research (TISTR)					93.98 ± 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.
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_633/25

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-R20	ACO	6236	00182003	10 November 2025	93.9	93.9
ACO-R21	ACO	6236	00182004	10 November 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)

คุณภาพน้ำทิ้ง

CERTIFICATE OF CALIBRATION FOR

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

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

DATE OF RECEIVED : 17 June 2025

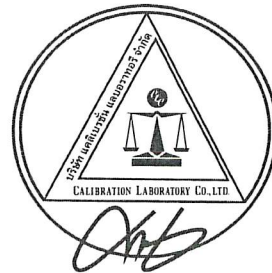
DATE OF ISSUED : 20 June 2025

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

Calibrated By : Sukgasem Seehanart
Wenick Inchaisri
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
20 June 2025



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

Certificate No. Q25070523

F3-011-05/12-23

page 1 of 4



@clccalibration

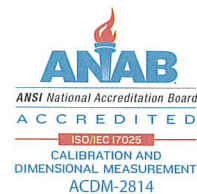


CLC
Accredited
ISO/IEC 17025

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
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CALIBRATION LABORATORY Co., LTD.

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

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

1. pH METER RESULT @ 25 °C

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

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

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

2. TEMPERATURE RESULT

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

Technical Note. Type of sensor : Thermistor

Probe \varnothing 3 mm

Materials : Metal Sheath.

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

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

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

End of Certificate

Certificate No. Q25070523

F3-011-05/12-23

page 4 of 4



@clccalibration

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : DIGITAL THERMOHYGRO METER
MANUFACTURER : ISOLAB
MODEL / TYPE : N/A
SERIAL NO. : N/A[TH 14/61]
CLID. NO. : 232100142
JOB CONTROL NO. : 250114004264
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 : 14 January 2025

DATE OF ISSUED : 16 January 2025

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

Calibrated By : Oranut Kamchatphai
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
16 January 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. Q25004264

F3-011-05/12-23

page 1 of 3



REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	DIGITAL THERMOHYGRO METER
MANUFACTURER	:	ISOLAB
MODEL / TYPE	:	N/A
SERIAL NO.	:	N/A[TH 14/61]
DATE OF CALIBRATION	:	15 January 2025

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. **WI-305-74**. The calibration was performed by using Chilled Mirror Hygrometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 36151.

Temperature & Humidity Chamber, PGC Model 9141-5114 S/N.0802282.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.
Certificate No. 22212, Due Date 23 February 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ 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. **Q25004264**

F3-011-05/12-23

page 2 of 3



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring digital thermohygro meter.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty ± (° C)
25.0	25.00	25.0	0.00	0.40

2. CORRECTION OF HUMIDITY

STD Temperature (° C)	STD Reading (%RH)	DUC Reading (%RH)	Correction (%RH)	Uncertainty ± (%RH)
25	50.0	49	+1.0	1.3

Note. The Scope of Accredited TISI Certificate No. 23-LB0092 Issue 02 Page 48 of 138

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

End of Certificate

Certificate No. Q25004264

F3-011-05/12-23

page 3 of 3





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

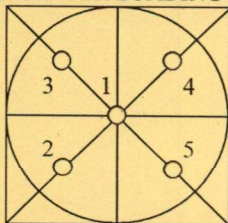
2. TARE FUNCTION : NORMAL

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

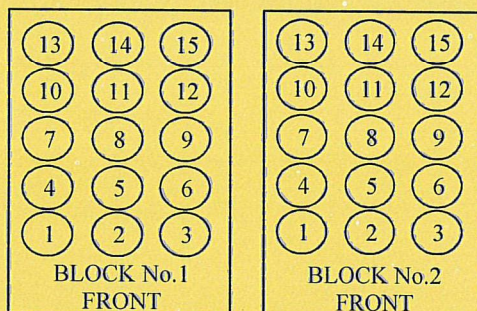
1. THIS INSTRUMENT WAS CALIBRATED BY DIRECT MEASUREMENT METHOD WITH CALIBRATED THERMOCOUPLE TYPE K UNDER NO LOAD CONDITION. THE THERMOCOUPLES WERE PLACED ON POINTS AND LOCATED AS THE PICTURE.

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





MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

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

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



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401
DATE TESTED December 18, 2025
1. MECHANICAL CHECKS

A. Inspect and clean all fans and filters.

☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK

2. OPTICAL CHECKS

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

4. PERFORMANCE CHECKS

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

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



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

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

Commissioning follow as commissioning performance sheets.

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



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

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

Service Department PerkinElmer Ltd.

Authorized Representative:

(Wiphan Promlumda)

Service Engineer



CALIBRATION LABORATORY Co., LTD.

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



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : CONDUCTIVITY METER
MANUFACTURER : METTLER TOLEDO
MODEL / TYPE : SEVEN COMPACT S230
SERIAL NO. : C141708983/5821320179[CD 05/65]
CLID. NO. : 272300452
JOB CONTROL NO. : 250204013412
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 : 04 February 2025

DATE OF ISSUED : 06 February 2025

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

Calibrated By : Sukgasem Sechanart

Wenick Inchaisri

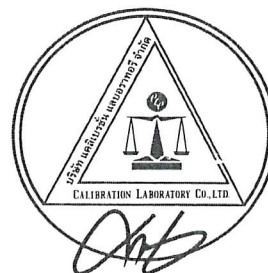
Calibration Engineer

Approved By :

Mongkol Yotsoontorn

Authorized Signatory

06 February 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. Q25013412

F3-011-05/12-23

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@clccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	CONDUCTIVITY METER
MANUFACTURER	:	METTLER TOLEDO
MODEL / TYPE	:	SEVEN COMPACT S230
SERIAL NO.	:	C141708983/5821320179[CD 05/65]
DATE OF CALIBRATION	:	05 February 2025

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

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

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

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

REFERENCE STANDARD USED :

1. Conductivity Solution , Hanna Product Code HI 7033L Lot Number 7830.
2. Potassium Chloride Solution (nominal 1.41 mS/cm)
3. Potassium Chloride Solution (nominal 12.8 mS/cm)
4. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
5. Precision Thermometer, ASL Model F201 S/N. 016168/09.
6. IPRT, ASL Model T100-250-1D S/N. PO106346-1-13.





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



TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Hanna instruments.

Certificate No. 20F21 , Due Date June 2025 .

2. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co.

Certificate No. HC30595403 , Due Date 31 January 2026 .

3. The measurements are traceable to International System of Units (SI) , through Sigma-Aldrich Canada Co.

Certificate No. HC20111554 , Due Date 30 September 2025.

4. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co , Ltd.

Certificate No. Q24120999, Due Date 26 November 2025.

5. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 0424/67, Due Date 21 February 2025.

6. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand).

Certificate No. TT-0035-24, Due Date 01 March 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. Q25013412

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@clccalibration

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

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

CALIBRATION DATA

1. Conductivity Solution Test @ 25°C

Standard Conductivity Solution	DUC Reading	Uncertainty of Measurement	k Factor
*84.00 µS/cm	84.02 µS/cm [Cell Constant 0.548589]	± 1.00 µS/cm	2,00
1414.0 µS/cm	1414 µS/cm [Cell Constant 0.548589]	± 21.0 µS/cm	2,00
12.83 mS/cm	12.84 mS/cm [Cell Constant 0.548589]	± 0.19 mS/cm	2,00

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

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

*2. TEMPERATURE RESULT

Immersion depth (mm)	Actual Temperature (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
100	25.01	24.9	+0.11	0.07

Technical Note. Type of sensor : Conductivity Probe

Probe Ø 12 mm

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

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

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

End of Certificate

Certificate No. Q25013412

F3-011-05/12-23


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คุณภาพดิน

GC Clarus 600/680 Preventive Maintenance (PM)

Company Name:	S.P.S. Consulting Service Co.,Ltd		
Address (Instrument Location):	7 Soi Phaholyothin24 Phaholyothin Road, Jompol, Chatuchak, Bangkok, 10900.		
Serial Number:	680S14042502	Service Tag:	N68APSSFEMP
Customer Name (if applicable):	Ms.Naruecha	PM number:	2 of 2
Service Engineer Name:	Monchai Kitcharoenkeat	Service Order Number:	WO-06815714
Date PM Performed: (DD-MMM-YYYY)	13-Aug-2025	Next PM Due Date: (DD-MMM-YYYY)	13-Feb-2026

Part Number	Release	Publication Date	
TH09370070	C	August 2016	

Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 600 and Clarus 680 GC by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

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

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Component List

Component / Specific Model	Serial #	Software Version	Configuration Notes
Clarus680	680S14042502	Totalchrom6.3.2	PSS, PSS, FID,
Clarus SQ8T	648N4050804	Turbomass 6.4	
AtomX	US14113002	Tekma AtomX	

Parts Lists

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

Procedure Checklist

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

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.

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

L-N 220 Volt

L-G 220 Volt

N-G 0.32 Volt

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

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

Carrier gas ☒ Helium ☐ Nitrogen ☐ Hydrogen

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

Detector gas ☒ Air Zero ☒ Hydrogen ☐ Nitrogen ☐ Helium

Moisture level ☒ Good ☐ Need to replace ☐ Other _____

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

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

Gas leakage ☒ Pass ☐ Fail Comment _____

- ☒ Perform general inspection of system for cleanliness.

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

Electronic cooling fan ☒ Yes ☐ No

Oven cooling fan ☒ Yes ☐ No

2. Electronic :

- ☒ Check oven temperature. Calibrate if necessary.

Oven temperature set point 150 °C ☒ Pass ☐ Fail

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

Oven temperature set point 5 °C ☐ Pass ☐ Fail

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

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

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

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

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

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

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

Detector Channel A	<u>0.98</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>Review of Preventive Maintenance:</p>	
<p>Authorized PerkinElmer Representative:</p> <p>Monchai Kitcharoenkeat <i>Monchai</i></p>	<p>Date:</p> <p>13-Aug-2025 (DD-MMM-YYYY)</p>
<p>Authorized Customer Representative:</p> <p>Ms.Naruecha <i>Naruecha</i></p>	<p>Date:</p> <p>13-Aug-2025 (DD-MMM-YYYY)</p>



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

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

CONFIGURATION TESTED		ACCESSORIES/COMPONENT NOT INCLUDED
MODEL	SERIAL NUMBER	
<u>OPTIMA 5300DV</u>	<u>077C7042401</u>	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION
<u>IPV Methods</u>		
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
<u>Multielement Standard</u>	<u>N069-1579</u>	<u>November 30, 2026</u>
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<u>10 % HNO3</u>		



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

SERIAL NUMBER 077C7042401
DATE TESTED December 18, 2025
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☐ OK

B. Inspect and replace as necessary, all torch components including the RF coil.

☐ OK

C. Inspect all tubing for sign of clacking or leaking.

☐ OK

D. Adjust water and gas pressure regulator settings.

☐ OK

E. Inspect and leak check pneumatics drawers.

☐ OK

F. Clean the exterior of the instrument.

☐ OK

2. OPTICAL CHECKS

A. Inspect and clean all optical components.

☐ OK

B. As required, check and replace all purgefilters.

☐ OK

C. Recheck optical alignment.

☐ OK

3. COOLING SYSTEM CHECKS

A. Perform preventive maintenance on chiller.

☐ OK

B. Flush out the chiller every year.

☐ N/A

4. PERFORMANCE CHECKS

A. Torch View Alignment.

☐ OK

B. Wavelength Calibration.

☐ OK



MAINTENANCE AND TEST CERTIFICATE MODEL

OPTIMA 5300DV

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MAINTENANCE AND TEST CERTIFICATE MODEL

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

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Service Engineer